The Monthly Journal of the AMERICAN ELECTROPLATERS' SOCIETY

A SOCIETY FOR THE ADVANCEMENT OF THE SCIENCE OF ELECTROPLATING

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American electroplaters' Society

The Monthly Review

VOL. XXIX JANUARY 1942 NO. 1

E. Engineering
Mrs. Edwin M. Baker
11-11-43
v. 29, no. 1-12

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Looking Forward

The resources of the Electroplating Industry are best understood through the unified efforts of the American Electroplaters' Society's branches, exchanging knowledge in conventions. Today, more than ever, when the entire resources of our country are being pooled for defense, this interchange of knowledge is necessary. The Electroplating Industry is contributing a small, but vital part, in the building of ships, airplanes, and tanks. Men building these are just beginning to fully appreciate the benefits to be derived from electrodeposition and the electrical treatment of metals. The last war brought rapid advancement in some of the phases of electroplating, and now, when time is short, and our hope for victory lies in the production of precision equipment and unfailing material, great strides are to be expected.

Interest in the Educational Session of the Grand Rapids Convention in June will be centered around the application of Electroplating to the war industries and production of essential commodities. Papers on basic Electrochemical theory and new developments of practice will be outstanding. A substantial number of papers by notable authors have already been contracted. Authors who are in a position to report on subjects relating to Electroforming, Electropreparation of metals, Anticorrosion treatment, Salvage by Plating, and Applications of Electroplating in Defense are urged to do so in the interests of this program. The complete field of metal finishing including organic and non-metallic surface films will be covered in the various educational sessions.

The advancement of Electroplating as an industry has been due largely to the combined efforts of the members of the A.E.S. The Society can adapt itself to the changing course of events from a peace time to a war time basis. The change in the industry has brought new problems and great dislocations which must be met through united effort and the exchange of experiences and ideas. The 1942 Convention in Grand Rapids should do much to help accomplish this.

C. W. SMITH, *General Chairman*
Grand Rapids Convention Committee.

Protective Coatings *for* Electroplaters

By CHARLES A. LANKAU
The Egyptian Lacquer Co.
Read before Philadelphia Branch, A. E. S., October 24, 1941.

UNDER the present conditions of national emergency where raw materials are becoming progressively more difficult to obtain, particularly for non-defense industries, the lacquer and coating industries in general, are more or less in the same position as the plating industry. Therefore, to state just what the coating industry can do to alleviate the shortage of plated metal is not possible. However, at the present moment, there are two possible materials which may be of some assistance and these will be discussed later.

The lacquer industry was to a large extent built up around the plating industry, having widened in scope and broadened into other fields later. The early spirit varnishes which comprised the first lacquers were practically the only suitable, or passable, coatings available to the plating industry to protect the beautiful lustrous finish of the polished plated metal. The urgent need of this industry for better and better finishing materials for greater durability and more adequate protection of these surfaces has prompted the coating industry to develop materials to more closely meet the intricate requirements. These finishes have been produced only after very extensive research on the part of the lacquer manufacturer aided by the development of new raw materials made available together with the close co-operation of the plating industry. Because of this co-operation and close affiliation it seems advisable to acquaint the platers with some of these raw materials to show what properties can be obtained and what are the limitations of the various ingredients which are reflected in the final film.

It is intended in this discussion to point out briefly and in a readily understandable manner some of the elementary principles of lacquer manufacture by pointing out a few of the essential ingredients and some of their behavior; to show something of the manufacture which might indicate certain precautions that would be desirable for the consumer; and to show some special types

to indicate some of the variance in formulation possible and discuss briefly some of the special types of particular interest to the plating industry. A very brief discussion on pigmentation should also be of interest since, due to the present shortage of plating materials, the enamels are becoming more necessary to the plater. Of especial interest should be a word about possible assistance of the coating industry to the platers in pointing out what can be offered and what can be substituted at the present moment. Of course, this situation might change overnight and the thought is given with that understanding.

Without going into the history of lacquers and the development of modern lacquers as they evolved from the old spirit lacquers, it is accepted that the essential or primary ingredient of the more usual type of modern lacquers is nitrocellulose. This, as the name might indicate, is made from cotton or wood linters (which are cellulose in the purest form found in nature) by the chemical action of a mixture of nitric and sulphuric acids under very definite, carefully controlled conditions of time, temperature, pressure, and acid concentration. The appearance of the nitrated cellulose is unchanged from the raw cellulose. The material is highly inflammable, being very close in chemical nature to gun cotton and, consequently, rarely handled in the dry state. It is wet at the source of manufacture with a non-solvent such as ethyl alcohol to reduce the fire hazard. There is also available for lacquer manufacture, film scrap which is a waste-product of the film industry. This material varies widely in its properties and quality and is, consequently, very rarely used in lacquer coatings.

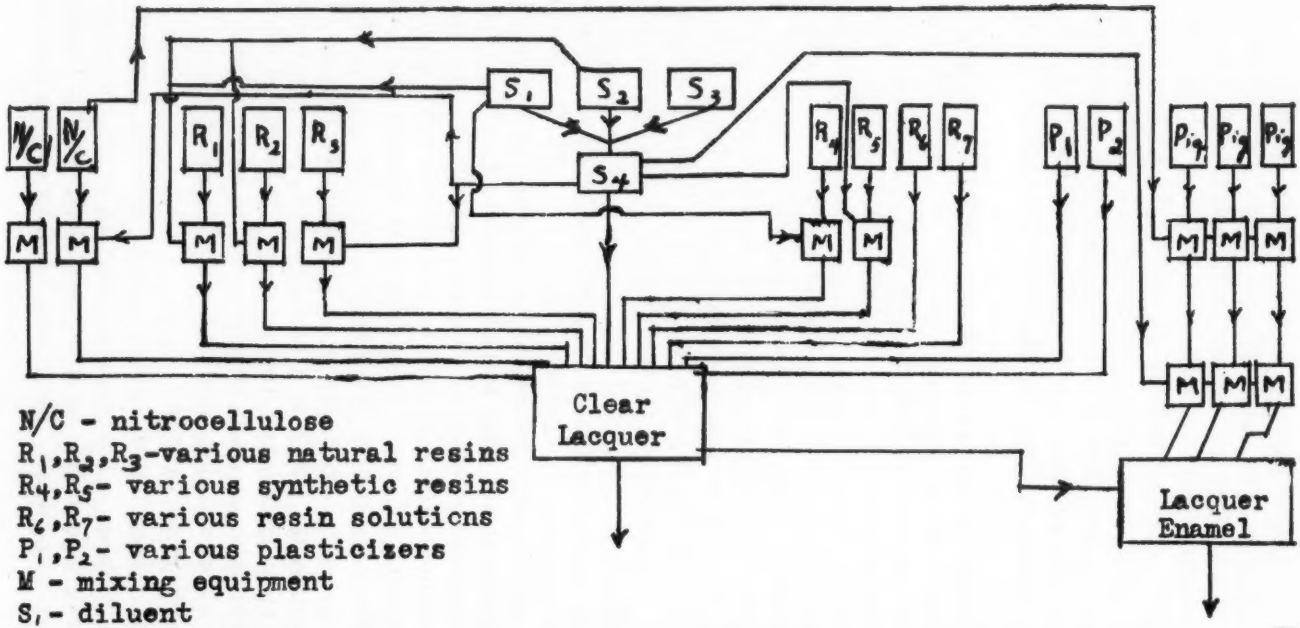
In the processing of nitrocellulose, it is possible to vary the properties of the final product by careful regulation and control of certain conditions during and after the nitration. In this way, it is possible to make different grades which will produce different viscosities of solution when dissolved in solvents. By way of illustration, a 24% solution of low viscosity nitrocellulose dissolved in certain solvent mixture and placed in a particular bubble viscosity tube might have the bubble rise in 2-3 sec. while a corresponding 24% solution of medium viscosity nitrocellulose would take 3 to 4 min. (180 - 240 sec.) and a similar solution of high viscosity nitrocellulose would take hours for the bubble to rise. And, conversely, a solution of high viscosity nitrocellu-

lose having a bubble viscosity of 3 sec. may contain 8.00% nitrocellulose while a corresponding solution of low viscosity nitrocellulose having an identical viscosity would contain 32% solids. Thus one contains four times as much solids or film-forming material as the other at the same viscosity. This shows that a measure of viscosities is not a satisfactory method of judging a good lacquer; neither does it show how much film-forming material you are obtaining in a gallon. The difference in appearance of the various grades of the dry material is only noticeable to the skilled.

Nitrocellulose is soluble in organic solvents but that solubility is unlike that of salt in water, etc., in that we are dealing with colloidal solutions in which there is no saturation point. But the concentration depends upon the mechanical strength of the equipment or on the practicability of the viscosity. This was shown above with the 24% solutions of the various viscosities of nitrocellulose. When the fibrous material is dissolved in solvents, a clear practically water-white viscous solution is produced; and, when poured on metal and solvent allowed to dry, a continuous clear film is produced. The film is harsh or horny and brittle, and undergoes great shrinkage during drying and has poor adhesion.

The solvents suitable for use with nitrocellulose are organic liquids which are volatile at room temperature. These solvents can be divided into three classes: (a) true solvents, such as esters, ketones, alcohol-ethers, and special mixtures of certain non-solvents; (b) latent solvents which do not dissolve but activate the true solvents, such as alcohols in mixtures like ethyl alcohol and ethyl acetate, etc.; and (c) non-solvents or diluents which are used to reduce the cost of the material, such as toluol, xylol, gasoline, etc., which, when used in proper amounts, have no injurious effect on the film but, if used in excess, will eventually precipitate the nitrocellulose from solution. Solutions of nitrocellulose containing excessive diluents tend to have higher viscosity than a corresponding solution with richer solvents and also may be cloudy in appearance.

Resins have been found to have certain desirable properties for use in lacquers. The natural resins of vegetable origin, mostly of recent formation such as rosin, elemi, shellac, damar, etc., are the most useful. They come from various parts of the



N/C - nitrocellulose
R_1, R_2, R_3 - various natural resins
R_4, R_5 - various synthetic resins
R_6, R_7 - various resin solutions
P_1, P_2 - various plasticizers
M - mixing equipment
S_1 - diluent
S_2 - latent solvent
S_3 - active solvent
S_4 - solvent mixture
Pig. - pigment

LACQUER AND LACQUER ENAMEL FLOW SHEET

earth, contain dirt, and vary in composition. They must be selected with care and are dissolved in large quantities to insure uniformity of product. They are put into solution in selected solvents to best dissolve them and yet be compatible with other ingredients in the formulation. In some cases, only part of the resin is used as with shellac and damar. They are useful in modifying nitrocellulose films to improve adhesion, increase gloss, reduce shrinkage, increase non-volatile content with reduction of viscosity of the lacquer. These resins tend toward brittleness and poor color retention and are, therefore, used with care.

Synthetic resins, as the name implies, are made by chemical synthetics. Illustrative examples are the maleic anhydride-glycerol resins, phenol-formaldhyde oil modified resins, sebacic acid-glycerol resins, rosin-glycerol resins, etc. These may be divided into two general classes: (1) hard brittle resins made to compete with natural resins, such as ester gum, Beckacites, amberols, teglacs, Lewisols, etc., and (2) the more or less plastic resins, as glyptals, Beckosols, Duraplex, Paraplex, etc. These have the advantage of uniformity and greater outdoor durability. The disadvantages are their high cost and danger of lifting when recoating.

In order to add flexibility or pliability to the film, materials called plasticizers may be used. These are chiefly true solvents for nitrocellulose and are relatively non-volatile at room temperature. Besides rendering the film more flexible, they also tend to soften the film. They also aid the adhesion and often the gloss to a certain point. The outstanding exception to this is castor oil, either raw or blown, which is not a solvent for nitrocellulose. It is cheaper than dibutyl phthalate or lindol but may turn rancid in the film, may become brittle with age, will darken in light, and tends to sweat out, particularly at elevated temperatures.

In the manufacture of lacquers, the nitrocellulose is dissolved in selected solvents by stirring the solvents and nitrocellulose together in glass-lined equipment in order to preserve good color. Long contact with steel or other metal discolors the nitrocellulose. Many precautions are taken during this operation due to the great fire hazards. The solution is then tested by the control laboratory for viscosity and total solids. When found correct, the material is pumped through a filter press to remove

undissolved fibres and incidental dirt. It is then stored in glass-lined tanks.

The resins are dissolved separately, also in glass-lined equipment, in selected solvents. In some cases, to use only the desired portion of the resin, specific solvent mixtures may be used. These solutions are tested by the laboratory for solids and specific characteristics of the particular resin. The solutions are filtered or centrifuged to remove sand, bark, etc., then placed in storage tanks. Some resins which require long storage, like shellac, are placed in glass-lined equipment; those requiring shorter storage are placed in tin-lined tanks. The solvent mixture used is selected not only for ease of dissolving the resin but also for ease of mixing with nitrocellulose solution.

The proper quantities of the desired nitrocellulose solution, natural or synthetic resin solution, or both and plasticizer and any additional solvents are mixed to make the final lacquer. This is again tested by the laboratory for all around performance and characteristics to see that all materials are properly incorporated and mixed. The function of the control laboratory is to test all incoming raw materials, intermediate solutions, and final products to assure proper quality and properties of all materials.

Pigments may be incorporated in lacquers to make enamels by several methods. One of the older methods is to place all ingredients, using a good all around vehicle, including the nitrocellulose, resins, plasticizer, solvents, and pigment in a mill such as a ball or pebble mill and grind until a smooth, homogeneous mixture is obtained. Then, any of the numerous colors can be intermixed to give any desired color match without changing materially any of the properties. This procedure, however, limits the final properties to those of any one particular vehicle. To vary the properties requires making a complete set of colors in a new vehicle. Such a procedure soon becomes cumbersome when many variations of properties are required. The more modern method involves making a concentrated pigment paste which contains a maximum pigment content and a minimum of other ingredients such as nitrocellulose (to give sufficient viscosity to prevent settling of the pigment), and of wetting agents to wet the pigment and give a good smooth grind, and sufficient solvent to dissolve the nitrocellulose to produce a practical viscosity. With such a pigment paste, a wide latitude of formulation is

possible with a single set of color pastes which may be added to any of many types of vehicles.

Some of the many types of lacquers include the following. (1) High viscosity type which contains low solid content, has relatively short life, gives thin film, for indoor use, very tough film, and light color. They are satisfactory for bronze mediums and old style silver lacquers. (2) Medium viscosity (just above duPont license type) which have fair solids (16%), good life, medium thick film, good adhesion, fairly tough film, primarily indoor use but some outdoor. These are very satisfactory for average metal lacquers where good protection and durability are the essential requirements. (3) Licensed materials of medium to low viscosity which have high solids (25-35%), excellent life, good film thickness, excellent adhesion, good gloss, darker in color, and more brittle. These constitute the higher priced materials giving maximum of protection, film thickness, durability, gloss, and hardness at the sacrifice of toughness, flexibility, and lightness of color.

Among the special types may be classified all types and variations of the above with exceptions to the general group properties. These are reflected in some of the following types: hardware lacquer, special perspiration resisting lacquer, silver and brass or jewelry lacquer, casket top coat clears, outdoor lacquer, and special spotting-out lacquer. Of especial interest to platers is the spotting-out lacquer which has been used with unusual success as an aid to preventing spotting-out. While it is generally believed that spotting-out is caused by the presence of plating salts within the pores of the metal and that it is prevented by eliminating them by various methods, it is not always 100% eliminated even by the utmost precaution when protected by the regular metal lacquers. With the proper precautions being taken and the usual preventive procedures used, not one single case of spotting-out has been reported with the special spotting-out lacquer. The exact significance of these results is not known but, at least, they are of interest to platers and merit consideration.

The role played by the coating industry in these times of scarcity of plating metals to protect and beautify the base metals is of particular interest. It is suggested that consideration be given to two methods of overcoming these difficulties. These

may be considered as substitutes or as additional devices for protecting or dressing up the product to have additional sales appeal without the use of plating metals. (1) Transparent colored lacquers may be applied over polished base metal to give various effects simulating plated ware. The more highly polished or brilliant the finish of the base metal, the clearer or more brilliant will be the final product. Any degree from a dull colored finish to a bright clear colored finish may thus be produced. (2) For articles which require the maximum of rust inhibitance and where opaque colors may be used, a light coat of zinc chromate primer may be applied. This may be air-dried as long as desired and baked out when convenient, as it air-dries for handling in 20 minutes to a half-hour but requires baking for maximum adhesion and protection. This may be followed with any air-drying lacquer enamel or baking synthetic enamel to give any desired color or finish that may be required.

These suggested devices for adding beauty and satisfactory protection to the base metal products with the conservation of plating materials are outstanding contributions of the coating industry to the plating industry in the immediate emergency. While the availability of these materials may change momentarily, they seem worthy of consideration.

A MESSAGE FROM THE RESEARCH COMMITTEE

We had a good meeting in Detroit. It was well attended and we had plenty of discussion. The first inspection data on the steel exposure panels was analyzed. It was felt that despite the fact that there were several definite indications that conclusions be left over until there have been more inspections. The plating of additional steel specimens was decided upon for the purpose of obtaining additional information of value. These additional samples will cover phases not directly connected with the effect of polishing on the corrosion resistance of the plate which is the immediate objective of the going program.

A committee was named to lay out the cleaning program which is the next problem we intend to tackle unless something more urgent intervenes. The sense of the committee is that if at all possible a short time project of rather general interest be tied into the present program. This job was assigned to the committee now headed by Mr. Hull and he will welcome any and all suggestions in this direction. The purpose of this committee is to be of assistance to the rank and file members of the society and to create more general interest in the research program.

We are now at war and it unnecessary to state that the facilities and cash of the Research Committee have been, through Dr. Blum, placed at the disposal of our Country. The defence of our Country supersedes everything else.

ERWIN SOHN, *Chairman Research Committee*

The Fundamentals of Electrochemistry and Electrodeposition

VI. Faraday's Laws (continued) and Current Efficiency

By SAMUEL GLASSTONE
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Weight of Deposit

By means of the equation given at the end of Part V, on page 982 of the December 1941 issue of the REVIEW, it is possible to calculate the amount of any metal that should be deposited on the cathode when a certain current is passed for a known time. Let us consider, for example, the deposition of silver from a cyanide bath: suppose that in a certain plating operation the current density recommended is 20 amps. per sq. ft., and the total area of the work being plated is 3.6 sq. ft. The strength of the current will then be 3.6 x 20 = 72 amps. Suppose that this current is passed for 1 hour 15 mins., i.e., 4500 seconds; what weight of silver will be deposited? In this case the current strength (I) is 72 amps., and the time (t) in seconds is 4500; the atomic weight of silver (A) is 107.9 and the valence (v) is one, so that by the equation referred to above, we have the required weight (W) of silver given by

$$W = \frac{72 \times 4500 \times 107.9}{1 \times 96500} = 362.3 \text{ grams.}$$

The same result may be obtained by utilizing the value of the faraday in amp.-hrs., namely 26.8. The time (t) is now expressed as 1.25 hours, and the equation giving the weight of silver deposited becomes

$$W = \frac{72 \times 1.25 \times 107.9}{1 \times 26.8} = 362.3 \text{ grams.}$$

To convert the weight into ounces *troy*, it is necessary to divide by 31.10, whereas for ounces *avoirdupois* the weight in grams should be divided by 28.35.

Thickness of Deposit

With the information now available it is possible to calculate, in addition, the thickness of the deposit. However, in this connection the assumption must be made that the metal deposits uniformly over the work being plated. This is, of course, not strictly true, but the results of the calculation give, at least, the *average* thickness of the plate over the whole of the work. The only additional information required is the density (specific gravity) of the deposited metal, and this can readily be obtained from tables. Knowing this fact it is possible to calculate the volume of the metal from its weight by utilizing the relation:

$$\text{Density} = \frac{\text{Weight in grams}}{\text{Volume in cubic centimeters (cc.)}}$$

or,

$$\text{Volume in cc.} = \frac{\text{Weight in grams}}{\text{Density}}$$

In the case under consideration, the metal is silver and its density is 10.5, and so the volume of the deposit in the problem is 362.3/10.5 = 34.5 cc. Now that we know the area of the material deposited (3.6 sq. ft.) and its volume (34.5 cc.), it is a simple matter to calculate the thickness, making use of the fact that: volume = area x thickness, or, thickness = volume/area. Before carrying out this calculation, however, we must note that the volume is given in cubic centimeters while the area is expressed in sq. ft.; on the other hand, the thickness of the plate is generally stated in inches. The simplest way of dealing with this situation is to reduce all the figures to the basis of the inch as the unit of length. The volume in cubic centimeters is converted into cubic inches by *dividing* by 16.4, so that the result is 34.5/16.4 = 2.104 cub. ins. The area in sq. ft. is changed into sq. ins. by *multiplying* by 144, so that the 3.6 sq. ft., given in the problem, becomes 3.6 x 144 = 518.4 sq. ins. The thickness of the plate is then given by:

$$\text{Thickness} = \frac{2.104}{518.4} = 0.00406 \text{ inch.}$$

It is thus seen that from a knowledge of the current density,

the area of the work and the plating time, it is possible, with the aid of Faraday's laws, to calculate the average thickness of the deposit.

It is a simple matter to reverse the calculations so as to determine the time required to produce a deposit of a particular weight or of a given thickness. Suppose we desired to plate a number of articles whose total area is 9.8 sq. ft., and the recommended current density is 25 amps. per sq. ft.; how long must the current be passed in order to obtain a deposit of silver 0.001 inch average thickness? The stages of the calculation are as follows: knowing the area of the work and the required thickness of plate, the volume of the deposited metal is first determined. Then utilizing the density the weight is calculated, and finally the time of plating can be found by means of the fundamental equation given at the end of Part V. Care must be taken, of course, not to confuse the units of measurement. In order to provide an exercise for the reader the details of the calculation will not be given, but the following results obtained at various stages may be used for checking purposes. The volume of silver deposited is 1.411 cubic inches, or 23.14 cc., and the weight is 243.0 grams. Since the total current is 245 amps., the necessary plating time is found to be 14 mins. 27 secs.

The foregoing calculations have referred, for simplicity, to the metal silver, but they may be adapted to any metal, provided its atomic weight, valence and density (specific gravity) are known; these data can be obtained without difficulty. Actually the results of calculations of this type may be summarized in a tabulated form, such as is given in the Plating and Finishing Guidebook issued by "Metal Finishing." For example, it is stated that 6.2 amp.-hrs. per sq. ft. are required to deposit 0.001 inch of silver. In the problem just given the area of the work is 9.8 sq. cm., so that the total quantity of electricity is 6.2 x 9.8 = 60.76 amp.-hrs. The total current is 245 amps., and so the time is 60.76/245 = 0.2479 hr., which is slightly less than 15 mins., as found above. It is true that the tables are convenient for purposes of arriving quickly at the required result, but it is only by understanding the fundamentals of the method of calculation that unexpected and unusual problems can be solved.

Current Efficiency

In the discussion so far the tacit assumption has been made

that the whole of the current passed is devoted to the plating out of the metal under consideration. This is not always the case, for very often, for instance in the deposition of nickel from an acid bath or of copper from a cyanide bath, a certain amount of hydrogen accompanies the deposition of the metal on the cathode. The fraction of the total current, expressed as a percentage, which is devoted to the deposition of the particular metal is called the *current efficiency* at the cathode. This can be readily determined from a knowledge of the actual weight of deposit obtained by the passage of a known current for a given time; for example, the passage of 48.5 amp.-hrs. of electricity should result in the deposition of 53.1 grams of nickel (atomic weight = 58.7; valence = 2). If, however, the *actual* weight of nickel plated out is 49.8 grams, the current efficiency is (49.8/53.1) x 100 *M* 93.8 per cent. This means that 93.8 per cent of the total current passed is utilized, in this particular case, for the plating of nickel; the remaining 6.2 per cent of the electricity is concerned in the evolution of hydrogen gas. The current efficiency for metal deposition varies to some extent with the plating conditions, and these are adjusted to give as high an efficiency as possible, otherwise there is a considerable wastage of electric power, and the solution becomes more alkaline. The calculations given in the earlier parts of this article are based on the assumption that the current efficiency is 100 per cent, but if it is known to be less, it is easily possible to make the necessary adjustment.

Just as cathodic current efficiency determines the proportion of current that goes to deposit metal on the cathode, so the anodic current efficiency tells us what fraction of the electricity passing causes the anode to dissolve. A high anodic efficiency is desirable for at least two reasons; in the first place, a low efficiency causes impoverishment of the plating bath, and, in the second place, the solution tends to become acid. The factors which determine current efficiency at anode and cathode, and the causes of the consequent changes in acidity and alkalinity will be considered in later articles.

Supplies and Defense

By W. D. STARR
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Waterbury, Conn.

THE outbreak of War in the Pacific has reduced or cut off completely the supply of a great many strategic materials. Of these items, the electroplating industry is particularly concerned with Tin, Chromium and Rubber.

All of our Tin comes from Singapore and the Netherlands East Indies. Although we have a considerable amount of Tin in this country, it has to be conserved. General Preference Order M-43 freezes the sale and delivery of Tin except for lots of less than five tons which may be delivered by distributors to their regular customers. On such deliveries the inventory provision of Priorities Regulation No. 1 will apply. Future movements of Tin will be regulated by specific allocation by the Director of Priorities. Already there has been issued Conservation Order M-43-a which contains "List A" of 29 items in which the use of Tin is restricted until March 31, 1942 and prohibited thereafter.

98% of our crude rubber comes from the Orient. Plans are afoot to triple our present 40,000 tons per year synthetic rubber production which will help. Meanwhile we have a limited supply of natural rubber which will be rationed. A temporary conservation order restricts consumption or processing of rubber except on orders rated A-3 or higher. There are certain exceptions to this such as fire hose. Of course the rubber ordinarily going into pleasure car tires will be available for industrial use with Defense orders getting preference as usual.

One-third of our Chromium ore comes from the Philippine Islands and New Caledonia and the remainder from Africa, Turkey and Cuba. Obviously we can expect a diminishing supply of Chromic Acid and more severe restrictions on its sale and use. As an indication, the delivery and use of corrosion or heat resistant alloy iron or alloy steel containing more than 4% chromium, is prohibited after January 6, 1942. This does not apply to work being done on ratings of A-10 or higher, nor does it apply to fully fabricated articles.

All burlap comes from India and the existing supply of new

burlap in this country is to be allocated. Meanwhile it is important to keep used bags in circulation.

As an example of tightening Government control over many items, private concerns will be unable to arrange for imports, as in the past, of 13 strategic materials including: Antimony, Cadmium, Chromium, Copper, Lead and Zinc. The Federal Government took control of all these imports December 27.

It has been announced that Chlorine will be subject to direct allocation after February 1. This may affect the delivery situation on Chlorinated solvents for degreasing machines.

Many firms have been making use of Preference Rating Order P-22 as amended to obtain rating of A-10 for operating supplies. P-22 has been superseded by P-100 which operates in a similar manner but contains some technical differences. It is very important to read carefully the restrictions on withdrawals and inventories before using P-100.

A new system for extending PD-3 Certificates by certification eliminates the necessity for having extensions signed by a contracting officer, thus saving everyone concerned much time.

All of the fundamental rules for operating under the Priority System are contained in Priorities Regulation No. 1 which has recently been revised. New features include provision that orders with B ratings (civilian) now must be accepted as well as Defense ratings. This constitutes another step toward industry-wide allocation. It is important to be familiar with this document as practically every individual O.P.M. order refers to it for general procedure.

PROCESSING MACHINE FOR ALUMINUM ALLOYS

A two-strand, cross-rod conveyorized Detrex Processing Machine has been specially designed and built by Detroit Rex Products Co., (13005 Hillview Ave.,) Detroit, Michigan, for the cleaning and treatment of metal parts. It follows an approved U.S. Army and British procedure for the treatment of aluminum alloy sheets used in aircraft to make them less pervious to the effects of air, and to provide a better paint bond.

The processing machine is a compact self-contained unit which incorporates hot alkali wash, hot water rinse, hot chromic acid dip, hot water rinse, and oven dry off. It is fabricated from steel plate, reinforced with structural steel, and is of all-welded construction supported on structural steel sill. The oven paneling is insulated with fibre glass. These processing machines are built in various sizes to accommodate individual production requirements.

Cadmium Plating *for* Aircrafts

By W. F. HODECKER, JR.

THE cadmium plating of parts for Aircrafts included in this paper will comprise only those contained in the ignition wire harness or radio shielding. These parts consist of a brass shield or manifold of either square, round or oval tubing, a short piece of bent brass tubing called an antler, brass elbows of various sorts, and a large number of different kinds of steel clamps and brackets.

The manifold is about five-sixths of a circle and varies in diameter from about 24 inches to 36 inches. Along the periphery of the shield are a number of 9/16 inch outlets and two 3 inch outlets which extend out from the tubing about one inch. All outlets are threaded and, as in the case in all threaded parts in the harness, are class three threads.

The antler is a short piece 1½ inch diameter bent brass tubing. The elbows vary from one (1) inch tubing on a 3 inch radius to 5/16 inch tubing on a 3/4 inch to one inch radius. Most of the elbows have a loose coupling nut. The brackets and clamps, for the most part, are made of a nickel steel alloy, that has been hardened after forming.

The preparation, cleaning, and plating of the various parts described will be divided: one for brass and one for steel. The brass manifolds and antlers are thoroughly sand blasted to remove all fire scale and silver solder and flux from the joints before the shield is delivered to the plating room. All brass parts are degreased, immersed in a soak cleaner or electric cleaner for a few minutes, pickled in a hydrochloric acid solution of about 10% strength, bright dipped, thoroughly rinsed, immersed in a sodium cyanide solution of 4 oz. per gallon, rinsed in clean water, and all steel brackets brushed with pumice, before plating. The parts are then plated for 20 to 25 minutes at a current density of 20-25 amperes per square foot, in a bath consisting of 3-4 oz. per gallon of cadmium, 10 oz. per gallon of free cyanide and a brightener. In the case of one manufacturer whose engineers refused to undercut the threads on the manifolds to allow for

plating, it was necessary to mask all threaded outlets with rubber before plating. As the threads had to be plated as well as the rest of the shield, this necessitated plating the manifold twice, once with shields on to obtain the specified 0.0002 - 0.0003 inches of cadmium and again to plate or flash the threads. This double plating was also found necessary with the elbows, as no other satisfactory method could be found to plate under the nut, other than to remove the elbow from the bath and move the loose nut by hand.

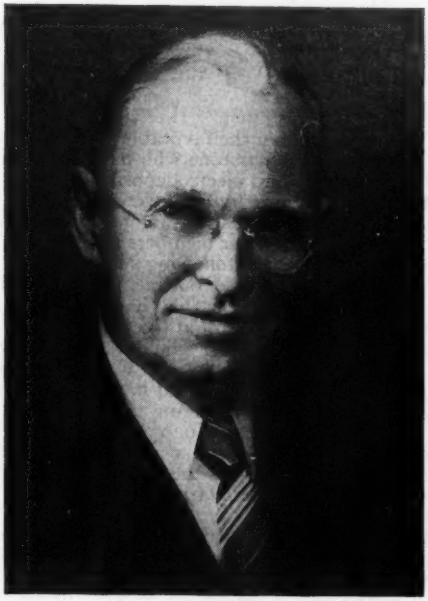
The steel brackets and clamps should be thoroughly sand-blasted before they are delivered to the plating room. However, as some manufacturers do not have a sand-blasting barrel, and most job platers certainly do not, some method must be determined to remove the heat scale from the steel parts. One method that has proven very satisfactory is to pickle the brackets or clamps, in a hot hydrochloric acid of commercial strength at 180 degrees F. for 2 or 3 minutes and tumble in sand and water. The cleaning process after the pickling and tumbling, is the same as that for any steel part free from scale: namely, immerse in a soak or electric cleaner, pickle in mild hydrochloric acid, rinse, cyanide dip, rinse and plate. The same current density and time are used as for the brass parts. After plating, all steel parts must be baked at 350 to 375 degrees F. for three hours to remove occluded hydrogen. One manufacturer of radio shielding, requires that all brackets and clamps be ball burnished after baking and this can be done with soap and steel balls in ten minutes of tumbling.

In the pickling of hardened steel parts to remove scale, it is well to bear in mind that hot hydrochloric acid should be used wherever possible as less hydrogen is occluded from it than from hot sulfuric acid.

In conclusion, it has been found that plating for aircraft motor manufacturers is a job that necessitates no more care than any other where quality and specifications are required. However, it still seems that in a great many instances the plating and finishing is the one thing to which the engineers and designers give the least thought. The particular job at hand will undoubtedly present problems of procedure that will require slightly different methods than the ordinary and will depend upon the ingenuity of the plater for solution.

Electroplating *and* Civilian Supply

W. W. McCord prominent member of Detroit Branch, A.E.S., has been officially appointed by O.P.M. to have charge of electroplating. He is connected with Electric Appliance, and Consumers Durable Goods Branch of Civilian Supply. Mr. McCord's address is Building E, third floor, second wing, Washington, D. C. Actually he has been working for Uncle Sam since early in December, but has only recently been appointed.



W. W. McCORD

He was born in Chicago in 1887, graduated from Princeton University in 1910, and has lived in Detroit since 1911. He has been a most active worker in the A.E.S. especially in his own Branch. All who have attended the Detroit Annual Meetings realize his capacity for getting things done.

We believe his appointment will mean much to the plating industry, in general, because of his background and experience. We assure Mr. McCord of our heartiest cooperation as he assumes his new duties.

TWENTY-FIRST ANNUAL JOINT SPRING MEETING ROCHESTER AND BUFFALO BRANCHES

to be held

Hotel Seneca on Saturday afternoon and evening

APRIL 18, 1942

We have been fortunate in obtaining some outstanding speakers for the Educational Session in the afternoon and will guarantee a swell time for everyone at the Banquet.

FACTUAL APPROACH TO THEORY

35 Dickinson Ave.,
Pittsfield, Mass.,
12-27-1941.

The Monthly Review
Springfield, Mass.
Mr. W. J. R. Kennedy, Editor

Dear Bill:

I noticed with much enthusiasm the favorable comments pouring in regarding the splendid articles of Dr. Glasstone who has been dealing with the fundamentals of electrochemistry and electrodeposition.

Inasmuch as there has been so much interest aroused in regard to the theoretical functioning of electrodeposition among the members of our society, and since a study of this nature by our members is a stepping stone to progress in our field, I would like to offer the following suggestion.

It is the writer's opinion that many of our members may find Dr. Glasstone's fine work a little technical inasmuch as they have not had the proper ground work to comprehend, the way they would like to, the valued data presented by Dr. Glasstone. With this in mind I would like to refer these members to one of our A.E.S. members, namely, Dr. C. B. F.(convention softball) Young. Dr. Young is no stranger to most of us and has through his untiring efforts, written a thorough course of study covering chemistry and electrochemistry as applicable to electroplating. Dr. Young has done a grand job on this course. It is presented in detail in such a manner that it is within the comprehension of all. Dr. Young presents the proper ground work to those who find this a necessary requisite. Best of all, this course is available to members of the A.E.S. at a low cost.

To those members who have had a good foundation in chemistry or electrochemistry I heartily recommend that they obtain Dr. Young's work on Electrochemistry as applied to electrodeposition, in which he covers the theoretical as well as the actual deposition of most plateable metals. Even if one does not care to study this, it is valuable as a reference.

Dr. Young's address is Box 292—Flushing, L. I., N. Y. To those not in the New York area the course may be obtained by mail.

Very truly yours,

Norman F. Plank,
Plating Dept. Foreman, General Electric Co., Pittsfield, Mass.

ELECTROCHEMICAL SOCIETY PAPERS

The special volume of the Electrochemical Society containing the papers on electroplating presented at the Chicago meeting is about to go to press. The edition will be limited. Those who have not reserved a copy should do so at once. Write to Dr. Colin G. Fink, Columbia University, New York, N. Y.

RESTORE OLD FLASHLIGHTS, HENDERSON URGES

"*Victory*" Dec. 23, 1941

Take a look around the attic, make a tour through the cellar, and find that old flashlight that can be made to work again for a few cents. Leon Henderson, Director of the Division of Civilian Supply, recommended last week.

Disturbed by reports that thousands of Americans are trying to buy new flashlights, Mr. Henderson obtained from one of the country's largest manufacturers a survey which showed that a vast majority of families need not fear blackouts if they will only put discarded flashlights to use.

"I am told," Mr. Henderson said, "that 70 percent of the families of this country possess one or more flashlights. Millions of these flashlights are forgotten, apparently—tucked away in the attic or the cellar.

FLASHLIGHTS

Elaborating on OPA's request that householders refrain from unnecessary purchase of flashlights, the Consumer Division has released the following information on methods of conserving flashlights and batteries:

1. The purchase of flashlights when they are not needed wastes plastics and electrical materials which are needed for the Victory effort. Scour the basement and attic for flashlights which can be rehabilitated. A flashlight consists of three main parts—case, batteries and bulb—with reflector, lens, switch and other minor parts. Any one of these may be damaged in an old flashlight, or new batteries may be needed. Bring the flashlights into an electrical supply store, a hardware store, or a 10-cent store, where parts may be bought separately. The girl behind the counter can help restore the flashlight to use.

2. Do not stock up on batteries. Batteries lose power as they stand, and it is useless to attempt to stock up beforehand. Buy only as your old batteries wear out.

3. Heat reduces the life of the battery. Keep the flashlight where it will not be near heat or hot water pipes. Moisture also is destructive of batteries. Like canned goods, the flashlight should be kept in "a cool, dry place."

4. The flashlight will find its greatest use in the home. It may become necessary to use the flashlight out of doors, but this is to be guarded against as defeating the purpose of blackout. In England during black-outs, pedestrians are allowed the use of small flashlights with dark red transparent materials (like cellophane) or with several sheets of paper pasted over the lens, so that only a very tiny glow is emitted. And the flashlights are pointed down when out of doors—never up.

5. If you do not use the flashlight often, check occasionally to make sure the batteries are in good condition.

If your friends' storerooms fail, and you find it nexessary to go out to buy, keep the following rules in mind:

1. Buy a flashlight with fresh batteries that are cheap and easily replaceable. Do not buy trick, novelty, or freak flashlights (pencil affairs, flashlights concealed in compacts, etc.) as these are not economical in the long run, and batteries are not so easy to get. Buy a standard type. Small flashlights which use one or two regular-size batteries are preferable to large, powerful ones, which use up critical materials in greater quantity, give unnecessarily powerful light, cost more in upkeep (batteries) and repair, and constitute a hazard to black-out, in that the light may penetrate black-out curtains and guide enemy aircraft. Look for an inexpensive case with good batteries and bulb. "De Luxe" cases and focusing features are not essential and cost more.

2. A flashlight that will stand by itself on the table or floor is preferable to one that must be supported or held in the hand.

3. In most cases the manufacturer will have a bulb in a flashlight that is adapted to that particular flashlight. Make certain, however, that the bulb is not high-current, as such a bulb will throw an unnecessarily high light and will drain the batteries more quickly.

Here and There

DETROIT BRANCH HELD ITS ANNUAL MEETING

The meeting place between East and West seems to be Detroit; especially when the electroplaters convene for their annual meeting in the auto city. It took place this year as usual at the Statler, on Saturday December 6.

Maurice R. Caldwell, President of Grand Rapids Branch and 3rd Vice President of the National Society, was the presiding officer at the Educational Session which started shortly after 2 P. M. Mr. Caldwell introduced Mr. W. J. Cameron of the Ford Motor Company who was listened to with close attention by the 300 men present as he gave some sound advice concerning National affairs during the present War emergency. The second speaker, Mr. S. P. Dorsey, Priority Specialist from O.P.M., Washington D. C., substituting for Dr. Stratton, went into the Priorities situation quite thoroughly and answered many questions regarding the metal situation, in which the platers are deeply interested.

The last speaker on the Program, Mr. B. E. Lewis of Detroit, chose as his subject "Design for Plating — 1941." This speaker's address paved the way for plenty of discussion. In fact, Mr. Lewis answered questions until it got almost time to prepare for the banquet which followed the Educational Session.

Mr. W. W. McCord was Chairman of the Committee. Those assisting him were Charles Beaubien, Carl Heussner, Walter Pinner, Wright Wilson, James Fritts, H. M. Cherry, George Nankervis, James Higgins and Warren Grimmer. These men are to be congratulated for the prompt and methodical manner in which the banquet and entertainment details were handled. The meal, to which 937 persons sat down, was all that could be desired. The decorations were beautiful, as were the gifts presented to the ladies as a remembrance of this delightful occasion. The men also were given a useful souvenir in leather marked "Detroit A.E.S., 1941."

The entertainment! Well, it had to be seen. Trying to describe it wouldn't do it justice. Suffice it to say that Detroit Branch secured the very best talent for the occasion. Every moment of the time was enjoyed by those fortunate enough to be present at this, the fifth annual meeting of the Branch.

The members of the Executive Board of the A.E.S. who were present held an all morning informal session.

The Research Committee with Mr. Erwin Sohn, Chairman, presiding, also held a meeting. Many matters of interest were discussed at both sessions.

The Executive Board was represented by Ellsworth Candee, President, Charles C. Conley, Maurice Caldwell and the Executive Secretary. Representatives from Grand Rapids, Dayton, Toledo, Cincinnati, Chicago, Pittsburgh, Anderson, Newark, New York, Springfield, Milwaukee, Rochester, St. Louis, Cleveland, and Waterbury were also noticed.

Chester Smith, General Chairman of the Grand Rapids Convention Committee, spoke briefly on the progress being made in connection with the 1942 convention. The prospects are very encouraging thus far.

We like the article written in the Detroit Branch Program, the closing paragraph of which reads:

> "The function of the American Electroplaters' Society is going to be to keep interest in plating alive throughout the period of curtailment; to see that research in plating does not cease; to see that plating is specified where it is of advantage to defense, and that if it is possible to do some decorative plating without impairing defense, that this is permitted. It will be its function to see that an adequate

body of men are kept acquainted with plating so that when the war is over they will be ready to jump in to help make the world a brighter and better place in which to live. The Society has a great duty to perform during a discouraging period, but it will not fail."

Somehow we can't help but feel that the advice thus given is more to the point than the pessimistic reports presented by some individuals at gatherings we have attended. This is not a time for gloomy forebodings. Wars are won by confidently facing the issue rather than giving way to despair. Let's "KEEP THEM FLYING."

INDIANAPOLIS BRANCH

At the invitation of Indianapolis Branch we visited that city on Wednesday Evening, December 3, to attend the regular meeting of the Branch at the Hotel Riley. Mr. Walter Binai and Mr. Charles Ogle of the P. M. Mallory Company met us at the station. After lunch we had the privilege of visiting parts of the large Mallory plant. We were particularly interested in the manufacture and testing of Rectifiers which are sold by the Udylite Company. Before leaving the plant we met Mr. Sparrow of the Sales Department, advising him of our work and our interest in Rectifiers.

President George Fisher of the Allison Corporation conducted the meeting of the Branch. After long discussion regarding increased membership in the Branch the President appointed Mr. Walter R. Lockwood of Elkhart as Chairman of the Membership Committee.

Mr. Tom Allison, of Advance Electrotype Company, was the speaker of the evening and gave a very instructive address on the plating operations peculiar to the printing industry. Mr. Allison brought many samples with him and answered questions to everyone's satisfaction. Mr. Leland Bass, Secretary, spoke of the proposed joint meeting of the Dayton, Toledo, Cincinnati, Anderson and Indianapolis Branches.

Questions and answers occupied the remainder of the time, those not having a question being penalized to the extent of 25c. This was a splendid meeting, well conducted by President Fisher. The discussions were particularly worth every moment spent in Indianapolis. We believe the branch will increase its membership under Mr. Lockwood's leadership.

We deeply appreciate the hospitality shown by Mr. and Mrs. Binai with whom we stayed overnight. How their three boys have grown since we saw them last year.

TOLEDO BRANCH

After waking the Binai household in the early hours of the morning we started for Toledo, Mr. Binai driving us to the station. Our good friend Walter Weiker picked us up at the Commodore Perry Hotel and drove us to the Hillcrest where the members sat down to a hearty meal before the meeting. President Charles T. Vannorsdall opened the meeting at 8. Here the problem is not so much increasing the membership but rather how to get the members to attend the meetings. Toledo branch is not alone in facing this problem, since nearly all of our meetings are suffering from smaller attendance because of defense work, and overtime.

Mr. Chester Smith, General Chairman of the Grand Rapids Convention, was the speaker and gave us all something to think about as he discussed various aspects of copper plating baths. Chet was on his feet for more than an hour answering questions at the close of his address. Mr. Smith told of the good work being done by his various committees in connection with the coming convention. He invited all to Grand Rapids' annual meeting on January 17 and to the A.E.S. Convention in June.

Toledo Branch has lost by transfer Mr. S. C. Shank who has gone to St.

Louis. The members wished Mr. Shank every success as he undertook new responsibilities in another city.

LANCASTER BRANCH

On December 12 there was a free for all discussion after a short talk on the following subjects by the members of the branch:

H. E. Kilheffer ..... "Cleaning"
R. Hoenstine ..... "Paint Evaluation"
H. Hovis ..... "Rhodium Plating"
C. E. Brubaker ..... "Hard Chrome"
K. Nuss ..... "Tin Plating"
N. J. Gebert ..... "Hydrogen Embrittlement"

We are sorry to learn of the death of Mr. John Leitner of York, one of the active members of Lancaster Branch.

NEWARK BRANCH CHRISTMAS PARTY

It takes more than cloudy skies and a torrential downpour to dampen the enthusiasm of the members of Newark Branch when they desire to celebrate the holiday season. The party was held at the Robert Treat Hotel on Saturday, Dec. 13. Past President of the A.E.S., Horace H. Smith, was chairman. He started the evening's festivities. It was also Mr. Smith who saw that nothing was left undone to make the party a success. Members and friends were all given the hand of fellowship and goodwill.

Paul Oldam took charge of the entertainment. This consisted of a Mystery Drama in which the committee took part. Harmonica and piano selections by George Wagner and Anthony DiNardo followed. The Ladies' Auxiliary with Mrs. William Hodecker, Sr., president, Mrs. George Klink, Secretary, and 17 members sang Christmas carols. A series of magic performances followed; the Magician being none other than Paul Oldam in person.

The entertainment features were well received by the 225 persons present; plenty of applause was given to those participating. Refreshments were served all evening and a buffet lunch at 11 P.M. Robert Pecoraro, a member of Newark Branch, held the lucky ticket in the Radio Raffle.

Before the evening's festivities ended, Secretary George Wagner was given a gold membership card case engraved with the Masonic and Elks' emblems. George is a member of both organizations.

The committee, with Mr. Smith as chairman, included George Wagner, Paul Oldam, John Kotches, George Klink, William Maguire, George Reuter, William Bruhns, Roy Stout, William Hodecker, Jr., Stephen Leshnick, August Dulje, and Fred Groh.

Dancing to music by Joe Basile's Madison Square Garden Band was enjoyed until the early morning hours.

The event was a distinct success. A genuine feeling of happiness, characteristic of Newark Branch members, made it one of the most enjoyable gatherings we have attended this year. The committee deserves our heartiest congratulations. Thanks everyone.

NICKEL SULPHATE PRICES

It has been called to our attention that second hand chemical dealers in certain sections of the country are asking premium prices for nickel sulphate. In order to be of service to our readers regarding prices for this item we have been reliably informed that any legitimate consumer who can prove that he requires nickel sulphate for prompt consumption can secure the same from the Harshaw Chemical Co. at the scheduled price of 13½¢ per pound delivered. This price has been in effect for some time.

ORGANIC FINISHING AND RADIANT HEAT

By G. A. Klinkenstein of the Maas & Waldenstein Co., Newark, N. J.

The subject of organic finishing is so vast that I have selected one phase, a new phase, infra-red baking or radiant heat baking as it is known today. Radiant heat baking was commercially introduced seven years ago by Ford in baking undercoats in their plant. The Ford engineers had at their disposal the very low cost for electricity. They attempted to follow an economy in their baking operations and succeeded in cutting it from two hours to twenty minutes. Before going deeper into the subject of radiant heat, it would be wise to mention that there are only three types of heat: first, convection (most commonly used) of which the radiator in one's home is a good example; second, conduction, best described by heating one end of a bar and noting the conduction of the heat throughout (this method is not commonly used because it is expensive); third, a log fire giving off a glow. When we speak of infra-red heat we are going back to a very old form of heating. We used as our source of heat an incandescent bulb.

With the use of infra-red by Ford a lot of misconceptions were built up. People felt that there was a sort of black magic about it. More harm was done to infra-red than anything else. We think of it in terms of heat units—B. T. U.'s and calories. It is just another source of heat. There are economics attached to it the same as if gas or oil were used for heating. Infra-red has one outstanding advantage. It gives primarily a source of heat which is directional and heats the work very rapidly. The heat is instantaneous. A twenty gauge metal can be heated to 300 degrees in two minutes.

The use of these lamps gives a very variable arrangement and units of them take up more or less space and cost little. The radiant heat oven by nature gives flexible arrangements and is best suited for work that is to be run on a conveyor. If a large amount of the same type of work is used, the greatest advantage of the infra-red may be gained. The surface upon which the ray is directed must be one which will absorb the heat. Color, size and shape have to be considered. To use this form of heat advantageously the paint manufacturers made especially quick curing enamels. Fundamentally, once the work is up to temperature with radiant heat the same condition exists as if it were in a convection oven. If we take electrolytic energy at 1½ kilowatts and compare it with fuel oil, B. T. U. costs are approximately in the order of fuel oil—1, gas—2, and electrolytic energy—4. Therefore, reduction in schedule is necessary. Paint materials must be used that are designed especially to give the same degree of cure in 15 minutes as would be obtained in one hour in a convection oven.

In using radiant heat there are a number of things to be considered. When the lamp is turned on, about ten percent of the energy is in the form of visible light. This serves as a valuable indicator. It tells whether the work is getting uniform heat. Obviously, where the work is evenly illuminated the work is evenly heated. Where there is no light there is no heat. Bearing this in mind, it is very simple to use sheets of paper or to put through pieces of work while watching the light pattern for the type of heat dispersion obtained. White has the least absorption. Polished metals reflect back the heat. Infra-red penetrates through the finish and bakes the finish from the inside out. With a pigmented oil finish the radiant heat is stopped at the surface and does not penetrate the paint film. The penetration does exist to a very slight degree though it does not get through to the metal. A synthetic baking enamel can be made to wrinkle very badly in a convection oven and baked again in a radiant heat oven resulting in a non-wrinkle surface. The most important advantage of infra-red application is the smooth finish obtainable.

A combination of radiant heat and convection ovens gives the advantages of both. A complete cure can be effected on a quick curing enamel by subjecting it to the rays of the infra-red lamps for a minute or a minute and a half and then passing it into a convection oven for fourteen minutes. In this way

both time and fuel are saved. The older type lamps are exceedingly low in cost and make a very efficient radiant heat oven. They are rather critical for spacing. The work has to be somewhere around ten or twelve inches from the lamps or there is a rapid loss of efficiency. New types of lamps have been developed which are almost like ordinary bulbs. A newer lamp consists of a built-in lamp reflector, which gives a lower unit cost. With a new type of lamp a 1000 watt sealed beam lamp was built right into the reflector and covered with a lens. It gives about an 18 inch band of useful energy. These lamps are very expensive and some of the advantage of low cost is lost.

Things to remember about radiant heat ovens are: they are quick heating; once the temperature is raised nothing more or less can be accomplished than in a convection oven as to effect; work can be turned out faster and cheaper.—From a paper read at Philadelphia Branch, May, 1941.

ELECTROLYTIC METHOD OF STRIPPING NICKEL FROM STEEL

Operating Conditions

Two have been offered, the details of which are paralleled.

	#1	#2
Container	Steel tank as cathode	Same
Material	Sodium Nitrate	Sodium Nitrate
Concentration	4-5 lb./gallon	4 lb./gallon
pH (colorimetric)	7.0-7.5 7.2 optimum	6.0-8.0
Temperature	100°-130° F. 120° F. optimum	90°-100° C. 194°-212° F.
Current Density	120 amps./sq. ft. approx.	100-200 amps./ sq. ft.
Pressure	9-12 volts	6 volts
Wetting Agent	Small amount Duponol (80)	.....
Correction	Acidity-Sodium hydroxide Alkalinity-Sodium nitrate	..... Nitric Acid
Hooks	Steel	.....
Cathode	Tank	Tank
Ventilation	Necessary	Necessary

Notes

If temperature is too high the steel will pit, if too low, the stripping is slow.

High current density is desirable for speed, also there is a lesser tendency to pit the steel.

The pH control is important. In a newly made bath this may be difficult. As bath is used it becomes more buffered—possibly by the nickel hydroxide formed—and then the pH is easy to control.

Hooks and racks corrode and they must be kept clean and replaced.

A wetting agent is beneficial but tends to produce excessive foam. A small gas pilot light will ignite continuously hydrogen that may be included in foam.

Solution should be kept so that a yellow color will be had with methyl orange and *not* give a pink color with phenolphthalein.

The electrolytic method of using Sulphuric acid should be compared with the Sodium Nitrate process.

All observations should be written down and the notes submitted.

The method of procedure is left to the wish of the investigator.

STRATIFICATION OF NICKEL SOLUTIONS

Solution Idle 48 Hours
Mechanical Plating

	Sp. G.	Oz./Gal. Nickel	Ammonium Chloride	Ph Colormetric
Top	1.050	1.55	1.12	6.8
Center	1.130	6.37	2.70	5.3
Bottom	1.140	6.91	3.20	4.4
Solution worked 5 hours after stirring.				
Top	1.100	4.27	2.13	5.9
Center	1.100	4.32	2.13	5.8
Bottom	1.100	4.44	2.13	5.7
Still tank — solution worked 7 hours.				
Top	1.060	2.23	1.99	5.7
Center	1.060	2.30	2.13	5.7
Bottom	1.060	2.34	2.20	5.7

STRATIFICATION OF BRASS SOLUTIONS

Solution idle 48 hours

	Sp. G.	Oz./Gal. Copper	Zinc	Free Cyanide
Top	1.165	2.13	0.62	1.38
Center	1.165	2.14	0.57	1.46
Bottom	1.165	2.22	0.57	1.51
Solution operated 7 hours.				
Top	1.160	2.13	0.60	1.68
Center	1.160	2.17	0.66	1.76
Bottom	1.160	2.18	0.65	1.84

PLATING TANK NETS

A new aid to good electroplating practice, (the HVWM Tank Net) has been placed on the market by Hanson-Van Winkle-Munning Company, Matawan, N. J. These nets are placed in plating tanks so that any work dropped may fall into the net; thus any work dropped is easily recovered by simply lifting the net out of the solution. This net, made of ½" stretched mesh, hung square, 6 thread medium twine, and made to dimensions as specified, can be used in nickel, cyanide copper, Mazic zinc, acid zinc and cadmium solution to advantage. It is not suitable for alkaline cleaners or sodium stannate tin solutions. Users of nets of this type advise us that contamination and consequent poor plating has decreased tremendously with the use of these nets.

SERVICE LABORATORY

The Du Pont Company has opened its new Cyanide Products Service Laboratory at the Niagara Falls, N. Y., plant of The R. & H. Chemicals Department. Staffed by chemists, metallurgists and technical service men, the company reports the new laboratories will be used primarily for the study and solution of customers' problems and for development of improved metal treatment and electroplating processes.

Also investigation of methods for removal of salts which form on sheet steel during pickling operations. Study of the general problems involved in metal cleaning already has resulted in industrial acceptance of a cyanide neutralizing process for cleaning steel sheets prior to vitreous enameling, bonderizing or galvanizing.

IRON AND STEEL FOR HOME COOKING APPLIANCES CUT 35 PERCENT BEGINNING JANUARY 1

Use of iron and steel in the manufacture of a wide variety of stoves, ranges and other domestic cooking appliances will be curtailed sharply beginning January 1 under an order issued December 13 by Priorities Director Nelson.

The order calls for an average cut of 35 percent during the period from January 1 to April 30 below the monthly average of iron and steel used in the 12 months ended June 30, 1941.

Between now and January 1, use of these critical materials will be frozen at the level of average daily use during the 12-month base period.

Quarterly saving of 58,000 tons

Producers affected by the order, numbering about 200, used approximately 500,000 tons of iron and steel in the year ended June 30, 1941. The initial curtailment is designed to result in savings of about 58,000 tons in the first quarter of 1942.

Curtailment is based on size of firms, so that many smaller manufacturers located in little Southern towns where no defense work is obtainable will not be faced with too serious a labor displacement problem. The industry as a whole is not well adapted for conversion to arms production, lacking the equipment for precision work. The industry employs approximately 60,000 workers.

Cooking appliances covered by the order include all types of ranges, stoves, hot plates, combination ranges, camp and trailer stoves, and fuel oil conversion range burners, using gas, electricity, coal and wood, kerosene, fuel oil or gasoline, or any combination of coal and wood or fuel oil with gas or electricity.

Companies classed by dollar volume

Companies are classed according to the factory sales value of products manufactured during the base period. The following table shows the percentage cut for each class during the first quarter of 1942:

Class	Factory sales value	Percent cut
A.....	$3,000,000 or more.....	42
B.....	$1,000,001 to $3,000,000.....	36
C.....	$1,000,000 or less.....	30

Government purchases of cooking appliances obtained on a competitive bidding basis for defense housing are excluded from the quota, as are lend-lease and certain other defense purchases.

Iron and Steel Covers Banned December 15

Other important features of the order are:

1. Effective December 15, no manufacturer is permitted to use iron or steel to produce cover tops or lids to cover cooking surfaces of cooking appliances equipped with tops or lids containing these materials.
2. Beginning February 1, no manufacturer can use any bright work, bright finish, metal finish, or trim containing copper, nickel, chrome, or aluminum in producing the applicances.
3. Inventories of raw materials, semiprocessed materials or finished parts are restricted to minimum requirements.
4. Manufacturers cannot shift production between different fuel types, except by appeal to the Office of Production Management.

Institutions Not Affected

The order, which does not affect institutional and commercial cooking appliances and does not cover repair and replacement parts, was drafted by the electrical products and consumers durable goods branch of the Division of Civilian Supply after meetings with industry representatives and after consultation with interested Government agencies.

Urged To Reduce Number of Models

In a letter accompanying the order, manufacturers were urged to reduce the number of models produced, concentrate on those making the most economical use of iron and steel, and adopt conservation measures such as substitutions, redesign, and respecification.

13TH ANNUAL CHICAGO BRANCH EDUCATIONAL SESSION AND BANQUET

Once again we are happy to invite you to attend our Annual Educational Session and Dinner Dance — this will be the thirtieth — to be given by the Chicago Branch of the American Electro-Platers Society. The date is Saturday, the 31st of January, 1942, and the place is the Palmer House, Wabash Avenue & Monroe Streets, in Chicago. All tickets $4.50 per person. Mail your checks to the secretary-treasurer.

The Educational Session will convene at 2:00 P.M. sharp in the Club Building in the Palmer House. After reading the following list of speakers and their subjects, we feel certain you will want to be there ahead of time in order to secure a good seat, and not miss any of the program as well as the discussions to follow each paper. We are sure you will agree the following men are going to present something of real practical value:

"A Short Report on the Metal Situation."
By DR. W. BLUM. (To be read by a member of the research committee.)

"Unichrome Alkaline Copper."
By MR. T. COYLE, United Chromium Incorporated.

"Uses of Black Oxide Coatings on Steel in the Present Emergency."
By DR. K. GRAHAM.

"Indium Finishes for Decorative and Functional Designs."
By DR. W. F. MURRAY, Indium Corporation of America.

"Some Plating Room Economies."
By MR. G. HOGABOOM, Hanson-VanWinkle-Munning Co.

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Business and Social News

BRANCH NEWS

Educational Activities

AMERICAN ELECTROPLATERS' SOCIETY

Springfield Branch held its regular monthly meeting at the Hotel Wendell in Pittsfield, Mass., on October 27th at 8:00 P.M. The meeting was called to order by President Wood who introduced Dr. H. H. Uhlig, Research Engineer of the General Electric Co., Schenectady, New York, who gave an interesting talk entitled "The Principles and Mechanics of Electro Polishing." Dr. Uhlig explained the composition of the various electrolytes he has used for electropolishing metals such as iron, stainless steel, etc. He also showed curves depicting the rate of attack at different temperatures for different concentrations and current densities. Several samples of electropolished stainless steel were passed around so the audience could see the results of the process. Dr. Uhlig was kept busy for some time after his talk, answering questions. He was given a rising vote of thanks.

We were then treated to the talking moving pictures that were taken in technicolor at the official outing at Pemberton Inn, Hull, Massachusetts, during the 1941 A.E.S. Convention. Al Baker of the M. E. Baker Co., Boston, took the pictures and supplied the remarks and sound effects. We are truly thankful to the M. E. Baker Co. for the loan of this film.

We were then shown the General Electric Film "General Electric and the Canadian Pacific Rail Road." This picture interestingly showed the part the G. E. Company played in the construction and electrification of the rail road. Interesting views of the Canadian Rockies were included.

After the educational session a short business meeting was held during which a letter from Maurice Caldwell, third vice-president of the National Society, was read. Mr. Caldwell suggested that some sort of a prize be given to the group or member who brings in the most new members during the coming year.

Mr. Clark suggested and a motion was made and seconded that the Springfield Branch entertain some of our members who have distinguished themselves in the local branch at a regional banquet in 1942. Mr. Clark was appointed chairman of the Committee and Mr. Kennedy to act in an advisory capacity.

After the meeting, refreshments were served. This was one of the most interesting and profitable meetings we have ever held, and our members from Pittsfield should feel highly complimented.

D. S. HARTSHORN, Jr., *Secy.*

Bridgeport Branch held its regular monthly meeting Thursday, November 6, at 8:00 P.M. in the Stratfield Hotel. President John E. Charleson opened the meeting with 32 members present. The sick committee reported Axel Boggild and Joe Sterling sick, but recovered from their illnesses. Membership Committee Chairman R. J. O'Connor reports good progress is being made in getting new members into the Society.

Edward G. Loeffell of the Remington Arms Company, Bridgeport, Conn. applied for associate membership.

Dr. Walter Meyer suggested the

In the Race for Time

the limpers get left.

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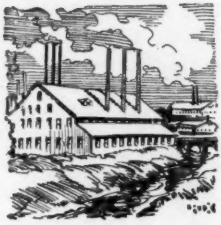

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business and open meeting held on December 5, 1941, with a short business meeting at the Chamber of Commerce Rooms from 8:00 to 8:30 and an open meeting at 8:30 in the Breakfast Room at the Hotel. An "Information Please" Session was conducted by our Librarian Clarence C. Helmle, with Dr. Walter R. Meyer, Mr. Bergman and Mr. Bucy as the experts on answers.

Good of the Order:

Mr. Prescott Albee and Edward Loeffell as new members were introduced to the Branch by President Charleson. President Charleson turned the meeting over to Dr. Walter R. Meyer substituting for C. C. Helmle who was reported absent. Dr. Meyer conducted a question box session which later turned into a bull session which proved very interesting and educational.

On October 17 an open meeting was held at the Stratfield Hotel at 8:30 P. M. with Walter E. Helbig of the Darco Corp. as the guest speaker on "Activated Carbon and Its Use." Mr. Helbig gave us a very interesting and complete talk and accompanied by slides, graphs and charts on the use of activated carbon.

JOSEPH G. STERLING, *Secy.*

Milwaukee Branch has not appeared in print in the Review for several months, and it all can be blamed on the Secretary. At our September meeting, Mr. James Poulson, who has been the Chairman of our membership committee, was elected as our second vice-president. He will continue to act in the capacity of membership chairman of the Branch, and will be very happy to lend a hand in bringing in new members to our Branch.

We now boast another father and son combination in Milwaukee Branch. William T. Lawrie and his son William J. have become members, and we will soon have another team. Nick Servatius' son Richard just handed in his application.

Mr. W. F. Simon of the Wisconsin State Industrial Commission addressed the Branch in September on "Apprenticeship," and a committee was appointed to see what we could do to further the idea of plating apprentices in our district.

During October Jack Geissman was pretty sick and confined to his bed, as was Bob Shaffer. Both are back on the job now.

At our October meeting Mr. Camel of the Detroit Rex Products Co. addressed the Branch on cleaners, both alkaline and solvent type. His talk provoked many questions, which Mr.

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2. Highest quality is deposited in shortest possible time.
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Camel answered to the satisfaction of the questioners.

Our November meeting educational session was devoted to a symposium on methods of testing the thickness of plated coatings. This was presented by Phil Ritzenthaler and Omer Doyle of Cutler-Hammer, and members of Milwaukee Branch. They really covered the field well, and the practical demonstration by Doyle was particularly interesting.

On December fifth we were very pleased to listen to Vincent Mattacotti of the Hanson-VanWinkle-Munning Company who carried silver plating from its beginning up to the present day, covering all of the various solutions in general use today, and enlarging upon the possibilities of silver plating today as a substitute for nickel and chromium. We always like to have Vince visit us, his talks are up to the minute, and his style delightful.

DEXTER F. RHODES, *Secy.*

New York Branch held its business meeting on Friday, November 14, at the Hotel Pennsylvania at 8 P.M. The meeting was called to order by President Liguori. Following the reading of correspondence and applications for membership and action taken thereon, a lengthy discussion was held on rinsing during pickling, dipping and plating operations. Mr. F. Fulforth, the past president of the Society was present and joined in the discussion.

On November 28 the Branch held its second meeting at the Hotel. Our guest speaker was Mr. Charles A. Lankau, chemist of the Egyptian Lacquer Manufacturing Company. Mr. Lankau presented an interesting and informative talk on "Metal Lacquers." He went into some detail on the various types of lacquers available, their

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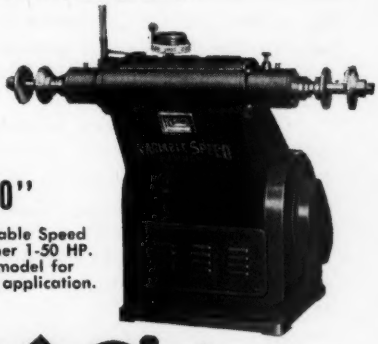

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physical and chemical properties and methods of testing same. At the conclusion of the talk Mr. Lankau was bombarded with numerous questions about problems connected with the preparation of metal surfaces before lacquering. He impressed the Branch with his grasp of the practical application of lacquers and problems encountered by the members and not only suggested the proper methods to overcome these problems but went into minute detail regarding cause of the difficulties. At the conclusion of the meeting the 73 members present extended to the speaker a rising vote of thanks.

EDWIN C. RINKER, *Librarian*

Newark Branch held its regular meeting on Friday evening, November 21, at the Hotel Robert Treat, Newark, N. J. The meeting was called to order at 8:30 P.M. with President Wm. T. Maguire presiding.

A communication from second vice-president George Wagner with reference to appointing a Chairman of an Educational Committee for Newark Branch was read by President Maguire who promised to appoint someone to act in this capacity.

Mr. Horace Smith, referring to the Christmas Party, reported that a committee meeting was held and that it was decided to charge Newark Branch members and their wives $1.00 per person for admission and all outside guests $2.00 per person. He further stated that the committee had decided that all the ladies attending this party should be presented with a gift.

Our Librarian, Louis Donroe, next presented the guest speaker for the evening, one of our new members, Mr. Myron B. Diggin of the Hanson-Van Winkle-Munning Co. His subject was "The Ductility of Nickel Deposits." It was a most interesting subject. Mr. Diggin explained the difference in hardness of Nickel Deposits from various types of solutions. His paper will be forwarded to the Monthly Review for publication. At the conclusion of his talk Mr. Diggin was given a rising vote of thanks by the 63 members present. A question box was then conducted by Louis Donroe and some of the members had some of their problems solved.

GEORGE WAGNER, *Secy.*

Boston Branch opened its regular meeting Thursday, December 4, at the Statler Hotel, with President Jones in the chair. One application was read for membership: Samuel Slavit, 89 Emerson St., Haverhill, Mass., Active. Joseph P. Laskey, Haverhill Plating Co., Haverhill, Mass., was reinstated.

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The chemistry class was reported as progressing nicely under the direction of George Swift and Dr. DuBois. President Jones displayed the new block and gavel presented to Boston Branch by the United-Carr Fastner Corp. The large number of visitors was extended a warm welcome and Boston is always glad to have all who are interested attend the meetings.

The speaker of the evening, George Hogaboom, was presented by Louis Gagnon, Librarian. Mr. Hogaboom talked on "Plating Room Economies," and also covered salvage and reclamation, substitutes, and new developments.

It is easy to understand why such a large number attended a meeting at which George Hogaboom is to speak. He delivered the most interesting and informative talk heard in Boston Branch in a long time. It was good to hear his prediction that electroplating will be more appreciated than ever, and that it is certain that great advancements will be made because of the defence emergency.

Several questions were put to the speaker following his talk and they are listed briefly on the Question Box page. Mr. Hogaboom was given an enthusiastic vote of thanks by his audience.

Immediately after the meeting, the members of Boston Branch got together to lay the groundwork for the annual meeting and Banquet to be held in March. Joe Barron is in charge, and complete committee, date, and place will be announced soon. Date of banquet is March 28, 1942.

The Librarian announced that the speaker at the next meeting, January 8, will be Robert Sizelove. He will talk on "Metal Cleaning," and will especially emphasize the changes in metal cleaning developed for, and necessitated by, the defence program.

A. W. GARRETT, *Secy.*

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Toronto Branch held its regular meeting December 5 at the Walker House Hotel with Buffalo Branch members as our gc sts, but owing to the inclement weather quite a few of the Buffalo members did not show up.

President Graham opened the meeting and after the usual business session called on Mr. Arthur West of the Canadian Hanson-Van Winkle Co.

Mr. West gave as his subject "The Manufacture of Sodium Cyanide, Nickel Suplhate and Chromic Acid." He showed slides of salt mines, etc. Mr. West is a splendid speaker and handled the questions with careful detail, the members showing appreciation for this very interesting talk.

Refreshments were served and the meeting closed at the usual late hour.

JAMES S. CAIRNS, *Secy.*

Toledo Branch held its regular meeting at the Macomber High School on Thursday November 6. The meeting was opened by the president, Mr. Vannorsdall, with all the officers, 15 members and 3 visitors present. The report of the sick committee and their suggestions were accepted. The fol-

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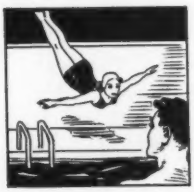
AMERICAN ELECTROPLATERS' SOCIETY

30TH ANNUAL NATIONAL CONVENTION

JUNE 8, 9, 10, 11

PANTLIND HOTEL . . . . GRAND RAPIDS, MICHIGA



And These Things Too . . . in 1942

lowing motion by Mr. Walter Weiker, seconded by Mr. Miner, was passed unanimously.

"Whereas Mr. Henry Schuldt has been a Charter member of the Toledo Branch since 1915, and has contributed much to the branch in so many ways through the years, by giving so freely of his knowledge, time, and money, for the betterment of the branch, and for the advancement of the science of electroplating in general, but what is more important, for his good fellowship.

Therefore, we the members of the Toledo Branch, with deep, and sincere appreciation for his untiring work in the field of plating, for his loyalty to the Society these twenty-seven years, and for his esteemed friendship, wish to make him an Honorary member of the Toledo branch of the American Electroplating Society, for life."

Dr. C. L. Faust of the Batelle Institute, the speaker of the evening, gave a very impressive talk on the subject of alloy plating. A long discussion was carried on, after Dr. Faust had finished his paper. Slides were also shown on alloyed plating. It was decided that the branch should give a dinner at the Hilcrest Hotel for its members; dinner to be at 6:30 P.M.; business meeting to start at 8:00.

GASTON BERGEMAN, *Secy.*

Anderson Branch held its regular meeting at the Y.M.C.A. on Tuesday, December 9. The meeting was called to order at 7:30 P.M. by President R. W. Oyler.

Mr. W. M. Phillips, Head of General Motors Plating Research at Detroit, Michigan, was the speaker for the evening. His subject was, "Plating and Plastics." His discussion of the various plastics and their uses was very interesting. He had a very colorful display with him.

In a Question Box session that followed, Mr. Phillips aided in answering several complex questions.

E. L. MCKINNEY, *Secy.*

Pittsburgh Branch held its regular meeting at the University Club Thursday, December 4, 1941.

Moving pictures of the Chrysler Tank Arsenal were presented by the Chrysler Corporation.

An Information Quiz Program was held with Mr. Glenn Herring acting as Master of Ceremonies. The experts on the platform consisted of Messrs Phillips of General Motors, Freidl of du Pont, Taylerson of Carnegie Illinois, Johnson of Weirton Steel, Hennessy of Pennsylvania Salt, and Saylor of Cowan Manufacturing Co.

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Indianapolis Branch held its meeting on December 3 at the Hotel Riley. The meeting was opened at 7:45 P. M. by President George Fisher, who announced that each member should put a question or $.25 in the Question Box. Mr. W. J. R. Kennedy, the National Executive Secretary of the A. E.S. and editor of the Monthly Review, was then introduced. He spoke on the function of the National Society and the relationship between the various branches and the National office. He stated that the Grand Rapids branch wanted papers and exhibits for the coming Convention. He also stated that he thought a Regional or joint branch meeting was a fine idea.

President Fisher appointed W. R. Lockwood, chairman, Mr. Repp, and Mr. Esner as a Membership Committee. he further appointed Blount, chairman, O. R. Jones, and R. J. Hennessy as a committee to investigate the possibilities of publishing an Indianapolis Branch Directory. Mr. Kennedy asked that the plans for the directory be submitted to the National Office before they were brought before the Indianapolis Branch. Mr. Leland Bass reported on the committee meeting in Richmond Indiana and stated that this committee had decided to hold a Regional meeting in Indianapolis on March 23. T. K. Allison, chairman, Bass and Cothran were appointed as a Regional Meeting Committee.

Mr. T. K. Allison, of the Advance Independent Electrotype Company, gave a talk on electrotyping which he illustrated with several samples in various stages of production. He described in an interesting fashion the various steps in the process; making the wax mold, spraying it with graphite, plating the wax mold, stripping the plate from the mold, backing up the plate and soldering it on another "bzcking" plate to produce the final printing plate for use in the press. The solutions used were described. These are the standard acid copper solution and the single salt-high chloride nickel solution.

Copies of the 1941 Convention Proceedings will be distributed at the meeting in January.

E. A. BLOUNT, *Secy. Protem.*

Philadelphia Branch held its December meeting on the second Friday, the 12th, due to the holidays. At 8:20 P.M. the meeting was called to order by the President, Harry Keller, with all officers present. President Keller turned the gavel over to our Librarian Gene Zurbach Jr., who, in turn, introduced the speaker of the evening, Mr. Albert Hirsch.

Mr. Hirsch spoke on the "Advantages

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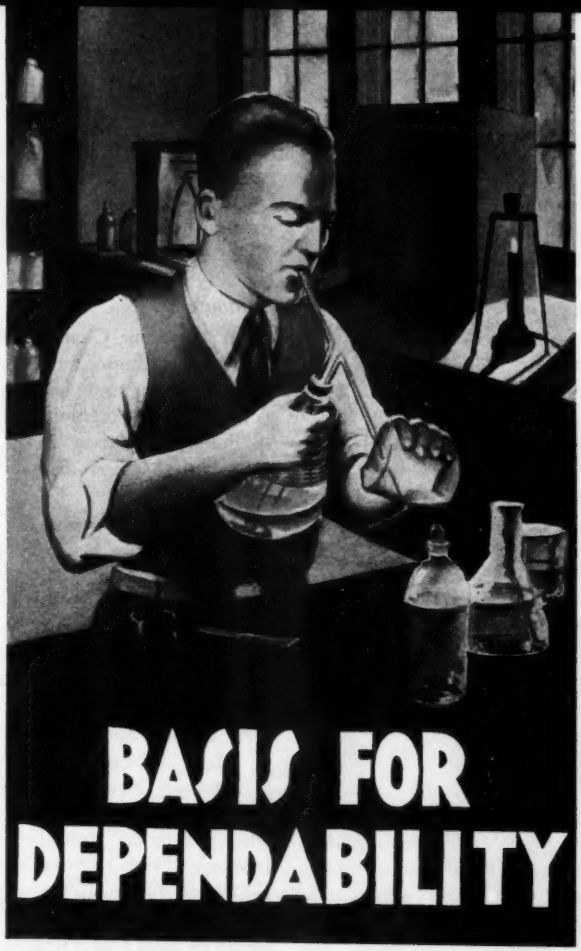

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and Disadvantages of the Salt Spray Test." After giving a short history of the Salt Spray and discussing the many advantages and disadvantages, several lantern slides were shown. Mr. Hirsch brought out this fact: "No standard method of conducting the Test throughout the industry."

John M. Freeburger and Daniel E. Mattie were elected active members of the Branch. Three applications were referred to the Board of Managers.

Under new business, Mr. Arthur G. Snow was elected second Vice-President of the Branch.

In the absence of Ray Eckert, Chairman of the Banquet Committee, the various other members, George Gehling, Del Robson, Joe Underwood, and Jack Dimon, gave a good report of the Annual Meeting.

PAUL MENTZER, *Secy.*

Los Angeles Branch opened its December meeting with considerably less than the usual number of members in attendance. The lack of attendance was due no doubt to an anticipated black-out of the city.

The members were saddened to hear that on December 4 Mrs. Elizabeth Lamoureux, the wife of Ernest Lamoureux, formost member of Los Angeles Branch had passed away. The Branch extends its deepest sympathy to Mr. Lamoureux.

Mr. Rynkofs, Chairman of the committee in charge of our Annual Educational Session and Dinner Dance reported that the committee had decided to hold our coming affair March 21, 1942, at the Los Angeles Breakfast Club.

Mr. ApRoberts, who is in charge of Exhibits for the National Convention from the Branch, made a report of the method of judging and the prizes to be awarded at the Convention. He also reported that a special effort would be made to encourage members to exhibit samples of their work at the local Educational Session. In the middle of Mr. ApRobert's report we were blacked-out but the meeting continued more or less calmly. It was a relief when the lights came back on and we proceeded with tightly drawn blinds.

Don Bedwell, our President, read a paper that he had prepared on "The Relative Costs of High-Speed Bright Plating versus Old Style Plating." While admitting that high speed bright

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plating solutions were a necessity for anyone who wished to keep in the running, Mr. Bedwell contended that the old style solutions were still essential for certain types of work. After a discussion in which the merits and faults of both types of solution were brought out the meeting was turned over to the librarian for the Question Box period and then adjourned.

ERVIN FRAUENHOFF, *Secy.*

Newark Branch held its first December meeting on Friday evening, December 5, at the Hotel Robert Treat in Newark, N. J. The meeting was called to order at 8:30 P.M. with Vice-President William Bruhns presiding. All other officers were present with the exception of President Maguire who was confined to his home with a cold.

Requests for George Muscio for a transfer to Waterbury Branch and Meyer Roter to Los Angeles Branch were read and the Secretary was instructed to answer these members to the effect that their requests had been granted.

The following applications were presented and voted to take the regular course: Louis Maine and Arthur J. Miller to Associate Membership.

Mr. Horace H. Smith, chairman of our Christmas Party, asked all the members to attend this social function, stating that arrangements were made to accommodate at least 200 persons and that a very good time was in store for all.

Our Librarian, Louis Donroe, next presented our first speaker for the evening, Mr. G. Byron Hogaboom, whose subject was "Impurities in Nickel Solutions" and then Mr. Harmon S. Hunt whose subject was "The Engineer's Relation to the Man in the Shop." Both subjects were very interesting and will be forwarded to the Monthly Review for publication. The speakers were given a rising vote of thanks by the 52 members present.

GEORGE WAGNER, *Secy.*

Hartford Branch held its December meeting at the Elks Club, Bristol, Conn., December 15. Mr. J. H. Donahue of the Abbott Ball Co. of Hartford Conn., was the speaker of the evening. His topic "Trends in Barrrel Finishing" was well presented and very interesting. The fundamentals as to design, types of barrels, types and sizes of balls, speed, time and cleanliness of work were explained in detail. Neutral soaps with additions of some alkali in certain cases were recommended and in the case of slightly hard waters more than the two or three ounces of soap per one and one-half cubic feet of work should be used to make up for the loss of soap necessary to soften the water. Two volumes of balls should be used for one volume of work. The balls must be kept clean and free

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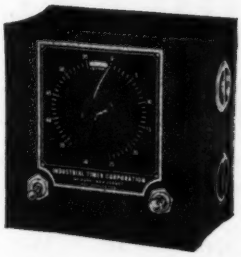

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from rust and foreign matter for good work. The black scum on the balls, from previous runs, can be removed by rolling with caustic soda and in severe cases of rust by rolling with fine emery and water. To obtain the final lustre necessary, roll the balls with Vienna Lime Powder and water. Numerous parts were shown as examples of good burnishing technique. Gun parts respond very readily to ball-rolled finishes. Small burrs or burrs partially polished can be removed and the remainder of the part highly finished, so as to take a good black oxide finish or plated finish. One member of the audience brought out the fact that soluble oil added to a sand roll operation would prevent objectionable gassing. It was pointed out that excess gassing can be very dangerous if the barrel is not vented at certain intervals.

This was a reguar meeting and Christmas Party combined. A number of fine gifts, given by some of the nearby supply houses, were drawn for and a handout lunch served to about twenty-five members and friends. Very good attendance for this time of the year.

APLEY N. AUSTIN, *Secy.*

Chicago Branch held its regular monthly meeting on December 13 at the Atlantic Hotel, President C. Kelly presiding and all other Officers present. The following applications were read and committees appointed on them. R. B. Paine, F. Johnsen, F. Kurt, J. G. Templin, J. J. Cardenas, and G. Sebastian, Jr., Mr. L. Bell and Mr. E. A. Keyser were elected to active membership.

Mr. H. R. Bielinberg and Mr. P. Moore were elected to associate membership.

Mr. Kelly appointed Mr. V. Mattacotti to assist our Educational Committee.

Member of Chicago Branch please take notice that our meeting night has been changed to the second Friday of each month.

A letter from Mr. W. J. R. Kennedy regarding the cost of 1941 convention Proceedings read and placed on file. Price to members elected after May 1941 to cover cost of printing $1.50; to non-members $5.00 each.

Mr. R. Hazucha was appointed as Chairman of the Plated ware exhibit with the following members of Chicago branch: E. Coffey, J. Bryden, G. Holmgren, and C. Kocour. Let's all cooperate with this committee and show Grand Rapids what a fine exhibit Chicago branch can produce.

Mr. G. Lawrence was transferred from Chicago to Syracuse branch. We don't like to lose George as he has been a member of Chicago branch since 1918. Our best wishes go with him.

Mr. L. Borchert introduced the guest speaker of the evening Mr. C. W. Smith of the J. C. Miller Co. of Grand Rapids. Mr. Smith spoke on "The Future of the Plating Industry." He made a very

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fine and interesting talk, telling of the many substitutes being used and made several suggestions as to the way the plating industry can be of service to our Defence Program. Now that Mr. Smith has found that it is such a short way to Chicago we hope he will visit us again soon.

The sound picture "The Making and Shaping of Steel" by the United States Steel Corporation was very interesting as well as instructive.

J. W. HANLON, *Secy.*

Baltimore - Washington Branch held another dinner meeting on December 6 in Washington. Twenty-seven members were able to get out to it in spite of defence work. These were amply rewarded by a clear and concise account of the various silver plating baths now in use, given us by our newest member, Mr. N. E. Promisel, whose membership from Providence-Attleboro Branch has just been received. Mr. Promisel is now with the Bureau of Aeronautics, Navy Department. Another valuable member, Mr. Milton Nadel, was also received by transfer, from the New York Branch. Six new members were elected, and seven applications were received. Our membership committee of Messrs. Warnock and Huston has been setting a hot pace, and, with the addition of Mr. Ermlich, should keep us out in front in the membership campaign. Chairman Barrows reported good progress in arranging for our annual meeting to be held in Washington on February 7. A defence program is being arranged for the educational session. President Beetham appointed Gerald Lux to look up an exhibit for the next convention (V. P. Wagner please note). The topic of silver plating brought out some interesting reminiscences from the old-timers. Ask George Gehling.

C. T. THOMAS, *Secy.*

Grand Rapids Branch held its regular monthly meeting December 12 at the Wolverine Room of the Rowe Hotel. The meeting was called to order promptly at eight o'clock, President Maurice Caldwell presiding. All officers were present, and the total attendance of members and friends was 68.

The minutes of the previous meeting were read and approved. Communications and reports of committees were then given. Report of the Committee on the Fifth Annual Banquet showed very good progress being made to date on the sale of tickets and it was noted that arrangements were rapidly being made for the success of our annual educational session and dinner-dance. Mr. Stewart Martin promised no one this year would be disappointed with the entertainment that is being arranged.

Two new members were elected—Mr. Gerrit Heeringa, and Mr. Traverse Williams. One application was presented for election.

There being no further business, the meeting was immediately open for our speaker, Dr. Stareck of United Chromium who talked on Electro-color

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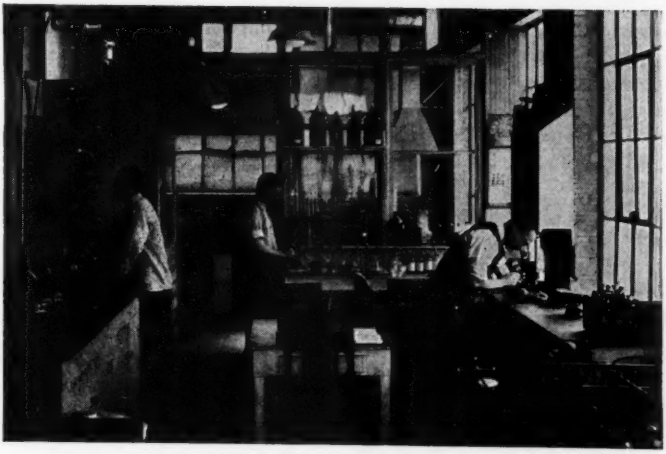

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and Patternplate, outlining the use of Unichrome Copper and special lacquers developed for use over Electrocolor and Patternplate. Dr. Stareck illustrated his data with a large display of samples which were plated with these processes.

All members seem to be very much interested in Dr. Stareck's Patternplate and Electro-color processes, and a number of questions were asked and more knowledge gained by having the questions asked and answered by him.

We were then given a rare treat of a two-reel sound movie in technicolor entitled "Steel — Man's Servant." This movie dealt with the mining of the ore, showing the different processes — being melted, equipment, method of pouring and a final showing of the finished steel product. The meeting was then adjourned.

C. E. ABEL, *Secy.*

Binghamton Branch held its regular meeting at the Hotel Cortland, Cortland, N. Y. on November 28. This meeting was conducted by our President, Mr. William Mahar. During the business session several members were transferred to the recently formed Syracuse Branch. After the business was transacted the meeting became a discussion session of individual problems.

The next meeting is to be held in Binghamton on the last Friday of January 1942. F. W. KENYON, *Secy.*

Waterbury Branch held its regular monthly meeting Friday, December 12 in the Colonial Room of the Hotel Elton. Dinner was served at 6:30 P.M. with twenty-three present. Wes. Cassell won the free dinner to which he is certainly entitled as he returns his card religiously each month.

The meeting was opened by President Colter at 8:00 P.M. with 43 present. It was announced that the business meeting was to be held Monday, December 29 at the home of E. T. Candee in Watertown.

Supreme President Candee advised us that consideration was being given to changing the name of the Society with the idea of broadening its activity and scope to cover all phases of metal finishing.

Supreme Secretary Kennedy, discussing the coming New England Regional Meeting, asked for an opinion as to the suitability of Springfield for this function, to be held either in March or April. It was the consensus of opinion that Springfield should have

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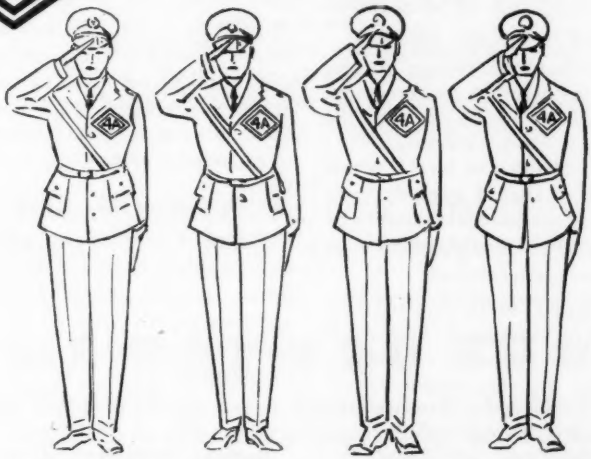

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NO WORRY ABOUT GLUE SHORTAGE WITH 4A CEMENT AND THINNER. Polishing wheels are free cutting, long lasting and economical when set up with 4A Cement.

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the opportunity of sponsoring this convention.

W. L. Cassell, chairman of the membership committee, advised that while we showed some membership increase, there were many other Branches considerably ahead of us. He has distributed many of the new bulletins, "Facts about the American Electroplaters Society." In his opinion, broadening the scope of the Society should increase membership considerably. He urged that all of us should work hard to obtain new members.

Technical-chairman, George Muscio, taking over the program, first presented a moving-picture supplied by the United States Steel Company, "The Making and Shaping of Steel," which was notable in that it gave us some conception of the immense equipment required and the ease with which huge pieces of steel are fabricated.

Dr. Dubpernell, in his regular book-review, briefly discussed several of Dr. Glasstone's works on Chemistry. Dr. Glasstone is a very prolific writer, and his books though of an extremely technical nature are very readable. George Muscio next introduced Dr. Glasstone who had for his subject, "The Relation of Theory to Practice in Modern Electro-plating." Dr. Glasstone explained his prolific writings, as being his hobby. His spare time is devoted to such work which he thoroughly enjoys.

Proceeding, he showed how theory predicted the nature of the deposits from different types of solutions, what may be expected from changes in current density, concentration, temperature, and addition agents, and what may be expected in the deposition of alloys. In most all instances the theory is borne out by practice, and theory has added much to the science of electro-plating. So far however no satisfactory theory has been advanced to explain the phenomena of throwing power.

At the close of the talk Dr. Glasstone answered a number of questions in explanation of every day plating problems. His talk aroused keen interest and was greatly enjoyed as was apparent from comments at the close of the meeting.

SPENCER L. HENN, *Secy.*

Buffalo Branch held its regular monthly meeting Friday, December 12.

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The meeting was called to order and the business session proceeded. It was decided after much discussion that the final vote be taken next month before a more representative group as to whether we make a bid for the 1943 Convention.

Mr. I. A. Lee, of the General Electric Co., our guest speaker, was introduced by Dr. Wernlund. We had for his subject "Rectifiers as Applied to the Plating Industry." These offered a simple, efficient and almost fool-proof means of providing D.C. suitable for the most exacting plating requirements. Regarding their longevity, he cited instances where they had been functioning perfectly for over twelve years. With a thorough knowledge of his subject matter he answered a wide range of questions in the ensuing discussion dealing with the more obscure problems which might be encountered. He was given a hearty vote of thanks and the meeting adjourned.

RODERICK MCGHEE, *Secy.*

New York Branch held its meeting on Friday evening, Dec. 12th., at the Hotel Pennsylvania. Among the 55 members present was a delegation from Newark Branch, including Mr. George Wagner, our 2nd. Vice President, Mr. Horace Smith and Mr. Bruhns.

Following a short business session the meeting was turned over to the Librarian who introduced the speaker of the evening, Mr. John Rolfe. Having had over 30 years experience in barrel plating, the speaker gave an excellent lecture on this subject. Mr. Rolfe not only outlined procedures for preparation of the parts to be plated, and the type of equipment most suitable for each part, but also gave precise figures on size of loads to use, the speed of the barrels, and length of time required to secure uniform deposits. His lecture was supplemented by diagramatic sketches in which he pointed out the source of trouble encountered. Apparently many problems were solved when the paper was open for discussion. Mr. Rolfe was given a rising vote of thanks by his fellow members and guests for his efforts.

Following adjournment, the audience enjoyed a Pre-Christmas party, and many toasts and good wishes were exchanged.

EDWIN C. RINKER, *Librarian*

Rochester Branch held its regular monthly meeting at the Rochester Turn Verein on Friday night Dec. 19 as a combination Dinner and Educational Session. There was a very good turn out to hear Dr. J. H. Sterner, Chief of the Industrial Hygeine Laboratory of Kodak Park, Eastman Kodak Co., give a talk on "Occupational

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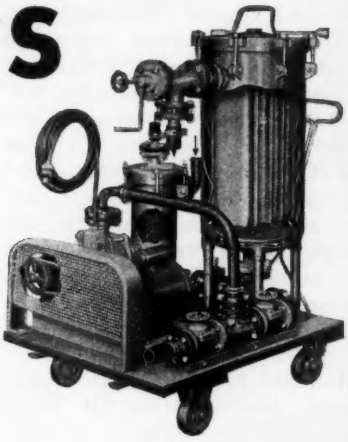

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Disease Hazards in Electroplating, Metal and Organic Finishing." Dr. Sterner turned out to be one of the most interesting speakers it has ever been our privilege to hear. His talk, which really made everyone sit up and take notice, will be published in a future issue of the MONTHLY REVIEW. After the talk Dr. Sterner was kept very busy answering questions. He was then given a rising vote of thanks for a really interesting and educational talk. The meeting was then adjourned.

JUDSON R. ELSTER, *Secy.*

Montreal Branch held its regular monthly meeting in the Mt. Royal Hotel Monday, December 1, 1941. The meeting which was well attended, was called to order by Vice President F. R. Lunn.

Six new applications for membership were received and a vote of thanks was extended to our second vice president Mr. J. Reisenberg for his worthy effort in securing new members.

At the conclusion of the business session the meeting was turned over to Mr. Charles M. Douglas of the Douglas Chemical Co., who spoke on "Cleaning Materials." He traced the improvements in cleaners from the old rock potash up to the present modern anodic and cathodic cleaners. Questions were answered and a lively discussion on cleaners ensured. Mr. Douglas received a vote of thanks and the meeting adjourned at 11 o'clock.

EUGENE FEELEY, *Secy.*

Springfield Branch held its November meeting at the Hotel Charles on the 24th at 8:00 P.M. The meeting was called to order by President Wood, and the minutes of the last meeting were read and approved.

Mr. A. Logozzo, 2nd. vice president, and chairman of the membership committee, reported that he will have completed plans for a membership campaign by the December meeting.

Mr. Clark, Librarian, announced the speakers for the December and January meetings and asked for suggestions from the floor for specific subjects or speakers for the coming meetings. Mr. Kennedy suggested the name of Mr. Warren of Devine Brothers.

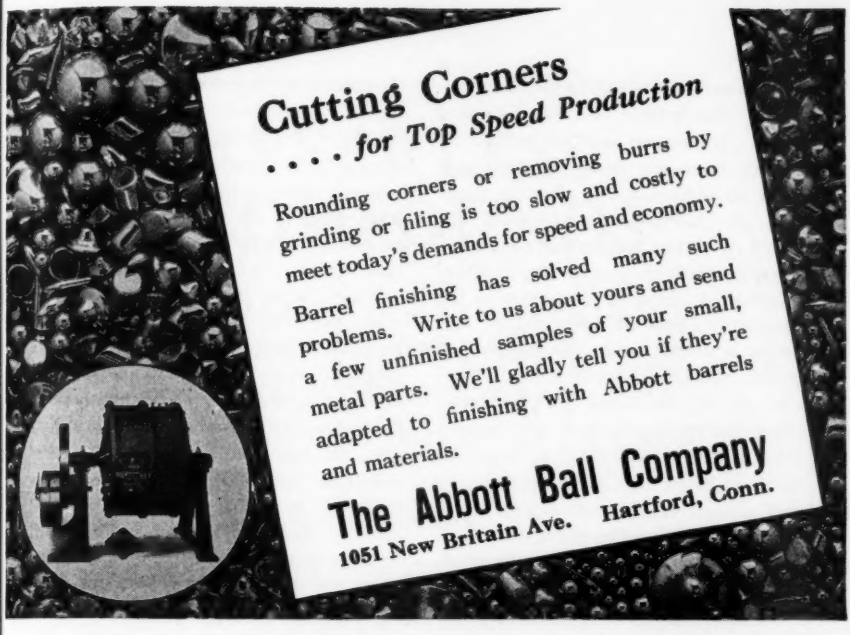
The Secretary read a letter from Mr. George Wagner, 2nd Vice President, in which he referred to an article in The MONTHLY REVIEW pertaining to the plated ware exhibited at the Annual Convention. He stressed the importance of these and requested that the president appoint a member to act as chairman of the exhibits committee. The Chairman will be appointed at the next meeting.

The president then introduced Dr. Walter Meyer, Editor of Metal Finishing, who presented an interesting talk on Modern Problems in Electroplating. Dr. Meyer reviewed the priorities situation, discussing the available quantities of metals and metal salts. He explained several methods for conserving these materials by analysis of solutions,, decreasing rejects, and saving drag-out from plating solutions. He offered suggestions as to what materials we might use to replace those now unobtainable. The talk was enjoyed by all the members and Dr. Meyer was given a rising vote of thanks.

D. S. HARTSHORN, JR., *Secy.*

Springfield Branch held its December meeting at the Hotel Charles on the 22nd at 8:00 P.M. The meeting was called to order by President Wood.

Mr. Logozzo, 2nd vice president of the branch and chairman of the membership committee made the following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suggestions for increasing the membership of the branch: 1. Each plating foreman to contact his platers and invite them to the monthly meetings, and if possible to secure them as members. 2. Salesmen members of the branch to contact friends and customers and urge them to attend the monthly meetings. 3. To designate one monthly meeting as "New Member Night" and feature a round table discussion lead by the Springfield members; all prospects to be contacted at least twice before the meeting. It might be possible to hold a joint meeting with the Hartford Branch to make the meeting more attractive. 4. Mapping out a program to revive the interest of some of the members who have not been attending lately. 5. Contacting and inviting all platers, even though they do not show any inclination to join when first approached. Make it a point to meet and introduce all guests and visitors. Keep a question box for use at each meeting so that all members and visitors may obtain help with their plating and finishing problems.

The motion was made and seconded that the Springfield Branch run it's first question box in conjunction with the regular January meeting.

President Wood announced that Mr. I. D. Niles has accepted the appointment of Chairman of the Exhibits Committee.

It was suggested that the Springfield Branch hold a question and answer session at each monthly meeting and that all business be transacted at a separate meeting held expressly for that purpose.

The application of Mr. Norman Searles, General Electric Co., Pittsfield, Mass. was read and placed on file.

The president then introduced Mr. George Hogaboom, Engineer of the Hanson-Van-Winkle Munning Co. who presented a very interesting talk entitled "Economies in the Plating Room." Following is a summary of some of the high-lights of his talk: All gun shells below a certain size are soon going to be made of steel instead of brass because of the shortage of this metal. The steel for some sizes will be drawn and copper plated five times between annealings. Copper is used to prevent work hardening of the surface of the steel, and to assist in the drawing operations. The new specifications of automobile bumpers just released specifies a minimum nickel thickness of .00015″ and maximum thickness of .0004″ The nickel will not be buffed. The chromium will be deposited .00001 to .00002 inches thick. Nickel and chromium will be recovered from the rinses and racks, In England they do not permit the deposition of copper on steel. Some bicycles are being chromium plated directly on steel. They are sold with no guarantee. One base box of tinned steel, 432 sq. ft. formerly plated with 1½ pounds of tin will now be plated with ½ pound. A recent newspaper article stated that the aluminum campaign was just a waste of time and energy because the aluminum will not be able to be used in the defense industry on account of the iron, copper and silicon impurities contained therein. This is a misstatement. The aluminum can be used to replace the virgin aluminum now used as a deoxidizer in the steel industry, which uses 30,000 million pounds of aluminum annually. Mr. Hogaboom also explained several methods for conserving metals normally lost in the plating industry.

His talk was thoroughly enjoyed by all members and visitors and he was given a rising vote of thanks.

D. S. HARTSHORN, JR., *Secy.*

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BALTIMORE WASHINGTON BRANCH

Annual Meeting and Banquet

Plans for the annual meeting and banquet which are scheduled to be held on Saturday, February 7, 1942 are nearly completed. The educational session begins at 4:00 P.M. and includes:

1. Technique of Heavy Nickel Plating.
   W. M. Tucker, Eastman Kodak Co.
2. The Plating Situation.
   W. W. McCord, Civilian Supply Branch O.P.M.
3. Military Applications of Electroplating.

A round table discussion led by Dr. Blum of the National Bureau of Standards. Representatives of the War and Navy Departments will participate.

The banquet, followed by entertainment and dancing, begins at 7:00 P.M. Both meetings will be held at the Lee Sheraton Hotel, 15th and L St. N. W., Washington, D.C.

ANNUAL MEETINGS IN 1942

Grand Rapids — January 17
Chicago — January 31
Baltimore-Washington — February 7
Boston — March 28

WHAT DO YOU THINK?

At a recent meeting of the executive board, considerable time was devoted to an informal discussion of the position of the A.E.S. in a changing world.

The electro-plater is, through necessity, rapidly adapting himself to a wide variety of metal finishes, some of which are in no way related to electro-plating.

Some of these finishes are substitutes for the duration, many will stay.

It was pointed out that a great many of those engaged in metal finishing with lacquers, synthetic enamels, etc., are entirely unrepresented in any organized group.

Recognizing the possible need for the extension of our educational effort into these wider fields, both for the benefit of our present membership and for those who are now unrepresented, your executive board has canvassed a representative cross section of the membership and find that there is a definite desire on the part of many, to enlarge the scope of our society to include all types of metal finishing.

In this connection, it has been suggested that the name of American Electroplaters Society be changed to a more inclusive name, such as the American Electroplaters & Metal Finishers Society, and that the membership rolls be opened to those engaged in all types of metal finishing.

The executive board feels that this would be a forward step which will add considerably to the knowledge of the arts of metal finishing, and have suggested that the 1942 convention committee arrange to present a number of papers which will deal with the newer and different types of finishes not covered by electroplating processes.

A fundamental change of this caliber should be considered from all angles and on a permanent basis, not merely as an emergency measure, in keeping with the present world conditions.

The executive board sincerely hopes for a generous response to this suggestion from every branch.

Secretaries of branches and members are requested to mail their comments and suggestions to the chairman of the educational committee at 900 Chestnut St., Sidney, Ohio.

A further report will be made through the columns of the REVIEW as soon as sufficient replies from the membership are received.

CHARLES C. CONLEY.
Chairman, Educational Committee.

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DARCO helps lick this plating problem

In the rush to get metal parts from the plating tank to the shipping platform, there simply isn't time these days for a high rate of rejects. And besides — every reject means a loss of plated metal and often of basis metal as well.

DARCO S-51 keeps plating solutions pure — helps you hold rejects down to rock bottom. By adsorption, Darco grabs and holds colloidal impurities, organic decomposition products, and other "ghosts" that lie in wait to spoil a plating job. Darco aids in preventing spots, dullness, and poor adhesion.

In addition, orders for Darco S-51 can be filled immediately. One dime buys enough to keep 100 gallons of solution clean for the best part of a week. If you like, we'll send you a liberal sample on request.

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New York, N. Y.

Membership Report

MAURICE R. CALDWELL, *Chairman, Membership Committee*

To January 1, 1942

ELECTIONS

Baltimore-Washington Branch

Calvin Baker, 59 Michigan Ave., N. E., Washington, D. C. Associate
John Peter Barak, 7-18-Street South East, Washington, D. C., Apt. No. 101 Associate
Eugene Thomas Chapman, 1300 Park Road, Washington, D. C. Associate
George A. Cappe, 5012 Hanna Place South East, Washington, D. C. Associate
Leon C. Hasker, 4326 Chewton Ave., Bradbury Heights, Md., Post Office, Benning D.C. Associate
Vernon A. Lamb, National Bureau of Standards, Washintgon, D. C.
Walter A. Olson, 1104 Trinity Place, Silver Springs, Md. Associate
Ernest E. Strobel, 4406 N. H. Ave., N. W., Washington, D. C. Associate

Bridgeport Branch

Edward Gregory Loeffell, 177 Bradley St., Bridgeport, Conn. Associate

Chicago Branch

H. R. Bielenberg, c/o Sears Roebuck & Co., Dept. 817, 925 S. Homan Ave., Chicago, Ill. Associate
E. A. Keyser, 4321 Grand Ave., Omaha, Nebraska Active
L. Bell, 2712 Potomac Ave., Chicago, Ill. Active
P. Moore, 684½ Strong Ave., Elkhart, Ind. Associate

Grand Rapids Branch

Charles B. Munton, Associate
Arthur L. Phillips, Associate
Gerrit Heeringa, 739 Nason St., N. W., Grand Rapids, Michigan Active
Traverse Williams, 1163 Second St., N. W., Grand Rapids, Michigan Active

Hartford Branch

Philip F. Atwood, Eagle Lock Co., Terryville, Conn. Associate

Los Angeles Branch

Charles DeMarquez, 16010 South Western Ave., Moneta, Cal. Active

Milwaukee Branch

William T. Lawrie, 329 No. Milwaukee St., Milwaukee, Wis. Associate

Newark Branch

Louis Maine, Associate
Arthur J. Miller, Associate

New York Branch

Joseph M. Boudreau, Dupuis Process, Inc., New York, N. Y. Associate
Joseph Varga, Queens Plating Co., Long Island City, N. Y. Active
David Hersh, Creative Ornament Co., New York City, N. Y. Active
George Fusco, W. L. Maxon Corp., New York, N. Y. Associate
Joseph Zappulla, Medallic Art Co., New York City, N. Y. Active

Philadelphia Branch

John M. Freeburger, Hatbora R. D. No. 1, Bucks Co., Pa. Active
Daniel E. Mattie, 1416 S. 8th St., Philadelphia, Pa. Active

Pittsburgh Branch

M. D. Stone, United Engineering & Foundry Co., Pittsburgh, Pa. Associate
John H. Pepple, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Active

MEMBERSHIP CAMPAIGN REPORT

BRANCH	May 1, 1941	Change in Membership	Percent Change
Balt.-Washington	43	+17½	+40.7
Montreal	29	+8	+27.6
Hartford	48	+13	+27.1
Toronto	66	+15	+22.7
San Francisco	38	+8	+21.1
Dayton	79	+13	+16.5
Pittsburgh	43	+6	+13.9
New York	121	+14	+11.6
Toledo	44	+5	+11.4
Bridgeport	72	+7½	+10.4
Grand Rapids	77	+6½	+ 8.4
Los Angeles	121	+9	+ 7.4
Boston	102	+7	+ 6.9
Waterbury	87	+5½	+ 6.3
Buffalo	49	+3	+ 6.1
Prov.-Attleboro	44	+2½	+ 5.7
Newark	136	+7½	+ 5.5
Chicago	234	+12½	+ 5.3
Detroit	260	+13	+ 5.0
Indianapolis	39	+1	+ 2.6
New Haven	100	+1½	+ 1.5
Cleveland	80	+1	+ 1.3
Milwaukee	92	+1	+ 1.1
St. Louis	79	—1	— 1.3
Rochester	76	—2	— 2.6
Springfield	69	—3	— 4.3
Anderson	40	—2½	— 6.3
Lancaster	44	—3	— 6.8
Binghamton	22	—1½	— 6.8
Cincinnati	53	—4½	— 8.5
Philadelphia	150	—15	—10.0

NOTE: Honorary members are included with each Branch.

MEMBERSHIP — May 1st, 1941 = 2537
MEMBERSHIP — Jan. 1st, 1942 = 2682½
GAIN IN MEMBERSHIP 145½
GAIN = 5.7%

Rochester Branch

Joseph Wesley, 161 Elmcroft Rd., Rochester, N. Y. Associate

Springfield Branch

Emil Bonanate, 751 East St., Pittsfield, Mass. Associate
Joseph F. Guitan, 567 East St., Pittsfield, Mass. Associate
Capt. Herbert S. Gronski, Watervliet Arsenal, Watervliet, N. Y. Associate
Frank W. Drake, 1420 Sixth Ave., Watervliet, N. Y. Active

Toledo Branch

Clifford Cole, 2325 Swiler Dr., Toledo, Ohio Active

Toronto Branch

William Mitchell, c/o Henry Birks & Sons, 636 Cathcart, Montreal, Canada. Associate
Charles Silverman, 5707 Mance Street, Montreal, Canada Active
Odelon Paquette, c/o Henry Birks & Sons, 636 Cathcart, Montreal, Canada Associate
Lionel Leblanc, c/o Henry Birks & Sons, 636 Cathcart, Montreal, Canada Associate
George Moses, 118 3rd Street, Longueuil, Quebec Active
Frank Boston, 5717 Hutchinson Street, Montreal, Canada Active
A. J. Findlay, 7 Coleridge Ave., Toronto, Ont., Canada Active
F. C. Darwin, 278 Burnham St., Peterboro, Ont., Canada. Associate

APPLICATIONS

Baltimore-Washington Branch

Thomas L. Johnson, 1629 Lyman Pl., Wash., D. C. Associate
Edward J. Peebles, 2423 Good Hope Rd., S. E., Wash., D. C. Associate
Glen R. Starkey, 2127 15th St. S. E., Wash., D. C. Active
John J. Slattery, 715-5th St., N. E., Wash., D. C. Active
Bernard E. Burmeister, 4306 Barrington Rd., Balt., Md. Active
Frank Collins, Ferndale, Md. Active
Clarence M. Shepherd, 3959 Nichols Ave., S. W., Wash., D. C. Associate

Boston Branch

Samuel Slavit, 89 Emerson Street, Haverhill, Mass. Active

Buffalo Branch

Joseph J. Fusco, 479 Fargo Ave., Buffalo, New York Active
Albert H. Baum, 213½ North 6th Street, Olean, New York Associate

Chicago Branch

R. B. Paine, c/o General Electric Co., 840 S. Canal St., Chicago, Ill. Associate
F. Johnsen, 3022 N. Whipple St., Chicago, Ill. Active
F. Kurt, c/o Automotive Rubber Co., 35 E. Wacker Drive, Chicago, Ill. Associate
J. G. Templin, 1746 N. Washtenaw Ave., Chicago, Ill. Associate
J. J. Cardenas, 2342 W. Madison St., Chicago, Ill. Associate
G. Sebastian, Jr., 4033 N. Major Ave., Chicago, Ill. Active

Hartford Branch

Reed E. MacLane, Hartford Machine Screw Co., Hartford, Conn. Associate

Milwaukee Branch

Frank C. Buschner, 921 North 34th Street, Milwaukee, Wisconsin Active
Richard Servatius, Modern Plating and Enameling Works, Freeport, Ill. Associate

New York Branch

Sebastian J. Carbone, Reinad Novelty Co., 256 W. 38th St., New York City Active
Seymour Weiner, Rex Products Co., New Rochelle, New York Active

Pittsburgh Branch

Joseph P. Davis, 905 Oliver Bldg., Pittsburgh, Pa. Associate